Use of Information and Communication Technologies in IDRC Projects: Lessons Learned

Michael Graham

Evaluation Unit
Corporate Services Branch, IDRC

April 1997

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Executive Summary

This study was designed to test some of Acacia's assumptions about the role of information and communication technologies (ICTs) in development by extracting lessons from previous project experiences. The overall objective was to provide input that would help shape the design and implementation of the Acacia program initiative by answering questions about the following eight topics.

- **Policies.** National ICT policies and legislation, as well as the policies of donor agencies with respect to ICTs, were influenced by project activities and consultations and lobbying efforts by Centre staff. These efforts were facilitated by email and Internet access. Geographic information systems (GIS) projects demonstrated the potential of this technology to encourage planners and communities to take a more holistic view of development problems.
- **Organizations and Interactions.** Program support helped create an "information culture" and an environment in which people with similar interests could share ideas and were encouraged to form professional associations and informal networks. Although ICTs supported these interactions, traditional communication continued to be important.
- **Resources.** Opportunities were seized to build on skills and equipment from previous Centre support and to benefit from links with other donors. Training included technical skills and "awareness" training for potential users and decision-makers. Projects emphasized regional training and relied on local capabilities to establish and manage ICT systems.
- **Barriers.** ICTs were most effective in overcoming barriers of distance and time. Electronic mail and associated list servers were used most often. GIS technologies helped overcome language barriers by presenting complex spacial relationships as more easily understood maps.
- **Innovative Solutions.** In most of the projects, ICTs were the innovative aspect of the project. Several projects provided access to hardware and software that offered capabilities that were previously inaccessible. These technologies provided project personnel with tools they could use to work on development problems.
- **Empowerment.** By providing improved access, enhanced sharing, and timely delivery of information, ICTs empower people to take action. Projects were able to create a culture of

communication and were most effective in this role when information was tailored to the needs of users.

- **Community Involvement.** Local grassroots communities continue to depend on cooperatives and local community organizations to mediate their access to the information provided by ICTs. Broader communities of users are being developed as ICT access spreads. Close attention to community needs and appropriately targeted information services and products are crucial if local communities are to benefit from ICTs.
- **Jobs and Economic Activity.** When jobs and economic activity were created, they were in most cases in the information and communication sector. It was difficult to find evidence for job creation beyond the individual projects. Nonetheless, a few projects created conditions that favoured economic activity or supported groups that could create or influence economic activity.

The Lanfranco framework helped focus on the current role, as well as potential roles, for ICTs in development projects. The analysis revealed that the projects used ICTs to different extents in their virtual workspaces (administration, communication, research and learning, and products and services). Within these virtual workspaces, email was used most often followed by access to digital objects. Groupwork was rarely encouraged by ICTs. As greater access to electronic communications grows in Africa, regional sharing of resources among institutions can be expected to grow in Africa. As a result, more attention will be needed on ICT policy and the planning of ICT inputs into projects. The establishment of an ICT evaluation framework could help focus such efforts.

Use of ICTs is expanding in Africa. It is important that government policies and regulations with regard to telecommunications anticipate this coming tide and that development activities take advantage of opportunities presented by ICTs. These technologies can alter the perception of development problems, provide opportunities for improved communications, deliver information quickly and inexpensively over great distance, and offer the potential to enhance regional collaboration to address common problems. To realize these potentials, close collaboration with communities and appropriate packaging of information products will be crucial.

Introduction

This study had the following objectives: (1) to test some of Acacia's assumptions about the role of information and communication technologies (ICTs) in development; (2) to draw lessons that will influence the design and implementation of the Acacia Initiative; (3) to identify opportunities for ICTs to enhance the utilization of IDRC-supported research results; and (4) to test the usefulness of the Lanfranco Framework for studying the value of ICTs in development research.

Acacia

ICTs allow people to collect, store, process, and access information and/or communicate with each other. How Africans use these technologies to solve their problems, organize their activities, and realize their own objectives will determine the impact that these technologies will have on the course of Africa's development.

The Acacia program initiative is based on certain premises about the role that ICTs can play in development, and specifically about the role they can play in Africa. Acacia is designed to explore how concerted investments in, and application of, ICTs by African communities can help build local resources to solve development problems. It has been developed based on programming experience of Centre staff and of Africans concerned with local development.

Much has been written about the Internet and the Information Superhighway in recent years. It holds much promise for breaking down some of the traditional barriers that have limited access by Africans to colleagues in other parts of the world and to the information and literature sources that allow them both to stay current in their field of interest and to share their ideas and results. However, ICTs are being increasingly looked toward to do much more. They are expected to "serve as catalysts to viable African communities, allowing them to profit from and contribute to an increasingly globalized society while simultaneously building on local goals, cultures, strengths, and processes... ICTs will enable these communities to participate meaningfully in the advance to global connectivity and to solve, thereby, some of their real development problems in equitable and sustainable ways."

(Communities and the Information Society: A Canadian Initiative for the Millennium). To realize these goals for ICTs, much effort will be required both to learn lessons from past experience and to learn from on-going activities. This research is a small step in that direction.

Methodology

This study was designed to test some of Acacia's assumptions about the role of ICTs in development by extracting lessons from previous project experiences. The overall objective was to provide input that would help shape the design and implementation of the Acacia program initiative and identify ways in which ICTs might be better used to enhance people's lives. This research sought to answer eight questions about 13 projects (Table 1). The questions were:

1. Have IDRC program activities: influenced how ICTs fit into the development plans and strategies of other agencies; fostered the wider use of ICTs and a pro-ICT attitude among all stakeholders — peoples, institutions, or governments; or stimulated relevant ICT policy development?
2. Have ICTs encouraged new types of organizations or new forms of social interaction?
3. Have IDRC projects that involve ICTs been able to develop the human and institutional resources necessary to support the adoption of ICTs?
4. Have ICTs helped overcome barriers to development such as language, culture, and distance?
5. Have ICTs promoted new and innovative solutions to development problems?
6. Have ICTs helped to empower individuals through access to information and affordable and timely communication capabilities?
7. Have IDRC projects that involve ICTs been able to encourage community involvement in the creation and use of these new technologies?
8. Have ICTs played a role in creating jobs or other forms of economic activity?

Table 1. Projects and sources of information. Abstracts for all projects are given in Appendix 1.

Number	Project Title	Sources of Information[a]		
		Project File	Program Officer	Project Leader
90-0305	Pilot Cooperatives Information System (Tanzania) (**Cooperatives Tanzania**)[b]	X	X	X
91-0064	ACT Regional Market and Trade Information (Eastern Caribbean) (**ACT Trade Information**)	X	X	X
91-0307	Land Trials Information Network (Brazil) (**Land Trials**)	X		X
91-1043	HealthNet: Satellite Communications Research for Development (**HealthNet**)	X	X	X
92-0611	Geographic Information System (Bihar) (**GIS Bihar**)	X	X	X
92-0616	Capacity-Building in Electronic Communications for Development in Africa (**CABECA**)	X	X	X
92-1152	REDATAM + GIS Generic Population-Related Application Tools (**REDATAM+GIS**)	X	X	X
93-8480	Community-Based Health Information and Planning (Kenya) (**Health Information Kenya**)	X	X	
94-0602	Sustainable Development Network (SDN) Pakistan (**SDN Pakistan**)	X	X	X
94-8008	PAN Mongolia (**PAN Mongolia**)	X		X
01269	Gender and Information Technology (APC Women's Networking Support Program) (**Gender and Information**)	X	X	X
02430	Public Process for Formulating Telecommunications Policy and Regulation: South Africa (**Public Process**)	X		
02770	African Networking Initiative: Defining a Plan of Action (**ANI**)	X	X	

[a] *Attempts were made to reach project leaders and program officers for all projects. The "X" represents projects for which responses were received.*

[b] *The bold face abbreviation is used in the text to identify the project.*

Table 2. Correlation between projects and answers to questions. The X indicates that information about a project is used in the text to help answer the question.

Project	Policies	Organizations and Interactions	Resources	Barriers	Innovative Solutions	Empowerment	Community Involvement	Jobs and Economic Activity
Cooperatives Tanzania	X	X	X	X	X	X		X
ACT Trade Information	X		X		X	X	X	
Land Trials	X	X	X	X	X	X	X	
HealthNet	X	X	X	X	X	X	X	X
GIS Bihar	X	X	X		X	X		X
CABECA	X		X	X		X		
REDATAM+GIS	X	X	X	X		X		X
Health Information Kenya		X			X	X	X	X
SDN Pakistan	X	X	X	X	X	X	X	X
PAN Mongolia	X	X	X	X	X	X	X	X
Gender and Information	X			X	X	X	X	X
Public Process	X	X				X	X	X
ANI	X	X		X		X	X	

The research was conducted over a 3-week period and was based on: a file review of 13 projects that had used ICTs to help achieve project objectives; questionnaires sent to project leaders by email or facsimile, or administered by telephone; and interviews with available program staff. A list of the people who provided information is given in Appendix 2, and the questionnaire that was used is shown in Appendix 3. By coincidence, this period of data collection fell during Chinese New Year, Ramadan, Caribbean carnival week, and the peak period for summer holidays in the Southern hemisphere.

Some of the projects were directly related to the technical aspects of ICTs, others used ICTs as tools to achieve projects ends. Table 1 lists the projects that were reviewed and the sources of information for each project. Table 2 shows which projects are referred to in the text to answer each question. It is important to point out that this review is based on the files that could be accessed in Ottawa and is restricted to projects supported by the former Information Sciences Division. They were chosen because IDRC staff thought they would provide some useful information for this review. They are neither representative of ISD projects nor of IDRC projects as a whole.

Because of the limits imposed by time and access, this review could not produce an in-depth analysis of the projects. However, it does point to some lessons that were learned and suggests areas in which additional research may be needed.

Organization of Report

The report is organized in sections that correspond to the eight questions. For each question, a short summary is followed by a review of the relevant findings and a list of lessons learned. A separate analysis was done to test the usefulness of the Lanfranco framework (see Appendix 4) for studying the value of ICTs in development research. The conclusion highlights concerns that are relevant to future investments in ICTs in Africa.

Policies

Have IDRC program activities: influenced how ICTs fit into the development plans and strategies of other agencies; fostered the wider use of ICTs and a pro-ICT attitude among all stakeholders peoples, institutions, or governments; or stimulated relevant ICT policy development?

IDRC has played an important role in policy development related to ICTs in Africa. Project activities influenced national ICT policies and legislation and the policies of donor agencies with respect to ICTs. Impact was achieved through consultations and lobbying efforts by Centre staff and facilitated by the use of email and Internet access. Centre-supported projects helped encourage the use of ICTs and the sharing of information. GIS-related projects encouraged a more holistic view of development problems, and community-based projects delivered planning information to farmers and health workers. Public awareness was raised by using a combination of seminars, training sessions, and newspaper articles.

These projects had both direct and indirect effects on policy, the use of ICTs, and how ICTs fit into the plans of other agencies. Some projects specifically set out to demonstrate the usefulness and create awareness of the potential uses of the technologies, others were oriented toward policy development from the beginning.

Broad Influence

A number of projects, due to the efforts of project leaders and IDRC program staff and the use of workshops, seminars, and publications of various sorts, had broad influence. The **HealthNet** and **ANI** projects encouraged other donors such as The Population Council, the Ford Foundation, the Rockefeller Foundation, and various UN agencies to become involved in funding ICTs in Africa. The **CABECA** project, and the associated workshops that were held in Addis Ababa on Telematics for Development and of African Ministers Responsible for Economic and Social Development and Planning, helped set the political agenda for support of ICTs in planning and decision-making. Such activities can have a long-term impact on policies at both the national and continental level.

Increased Use of ICTs

The **REDATAM+GIS** project attracted attention from the American Development Bank, which is interested in introducing the software more widely in Latin America as a government tool for data analysis and interpretation. REDATAM+GIS allows users to cross-tabulate census information with any geographic area they define. According to the project leader, census data were not shared 10 years ago. Now, statistics offices share this information with other government departments and local authorities. For example, the statistical office in Chile currently distributes census data to 335 municipalities. In the words of the project leader, a great achievement of the project was its ability "to generate interest and enthusiasm among the development planners for this (GIS) technology."

The **GIS Bihar** project introduced policymakers to the potential applications of GIS. The Ministry of Finance in Bihar plans to adopt GIS technology to determine the best locations for rural banks. In addition, a GIS package was developed to promote industrialization and invite foreign investment in Bihar; GIS is being used for planning watershed development; and in a UNICEF project, GIS is being used for educational planning. The Commissioner for Cooperatives in Tanzania has expressed interest in using the data-management system developed in the **Cooperatives Tanzania** project throughout the cooperative movement in Tanzania. In Mongolia, the Ministry of Foreign Affairs plans to use the Internet access provided by **PAN Mongolia** as a mechanism for international public relations, and the Ministry of Infrastructure Development is studying the use of email as a cost-effective tool for rural communication.

Policy Advocacy

Projects such as the **ANI, Gender and Information,** and **Public Process** took a direct approach to policy advocacy. The **ANI** project was designed to articulate a policy framework for Africa and was successful in developing a more collaborative and transparent working relationship among agencies interested in ICTs in Africa. The project increased awareness and helped sensitize government officials to the potential of ICTs in Africa and the need to look at national policies related to access and service provision. A planned extension of 1 year to this project will expand public awareness at the national level.

The **Gender and Information** project created links among key women's groups and facilitated lobbying efforts at the Beijing Women's Conference. As a result, the platform of action that resulted from the meeting recognized the rights of women to have equal access and training in new ICTs. In addition, the project leader of this **Gender and Information** project reported that the coordinator in Kenya is actively involved in a national and subregional East African Internet lobbying forum. Although no direct changes in government policy have occurred, the forum acts as a source of public debate and lobbying. Through the exposure and respect they have gained in the project, several of the women have also become more involved in intergovernmental activities through representation on advisory committees to donor and UN agencies.

The **Public Process** project involved IDRC directly in the creation of national ICT policy. Direct participation in the writing of a green paper, in soliciting public input into this green paper, and in the drafting of the final legislation helped inform and guide policy development. ICTs played direct roles in linking groups and facilitating communications in all three of these policy-related projects.

Public Awareness

Many of the projects have successfully sensitized a broad range of people to the potential applications and benefits of ICTs and altered public perception. At the level of individual users, some users, such as community leaders in Brazil, have come to see ICTs as a means of communication that is within their grasp and no longer the privilege of those in power. According to the **Land Trials** project leader, they have accepted ICTs as part of their array of communication methods. In Pakistan, individuals and businesses were among the first to adopt and use the new communication facilities that were created. Efforts by the **SDN Pakistan** project to increase public awareness seemed to reach a sensitive audience within these groups, but the project was less successful in altering government methods of communication — government users accounted for only about 5% of those connecting to the email services.

Government Acceptance

Government departments face greater hurdles when making decisions to alter their communications methods. Efforts should continue to demonstrate the advantages and cost savings of email over mail,

fax, and telephone. Government concerns about security and information flows may have to be overcome in countries that have traditionally been more concerned with limiting free access to information rather than encouraging free flows. In Ethiopia, for example, the Program Officer suggested that **ANI** was successful in raising government awareness; however, this spurred government efforts to gain greater "control" over the Internet and to create a monopoly supplier rather than allow open competition.

The **HealthNet** project was successful in obtaining government clearances and licenses to use LEO satellites for communication purposes by making the argument that this technology was being used for the public good. In **GIS Bihar**, considerable effort was made to hold workshops for government officials and decision-makers and members of the academic community to raise their awareness about GIS technology.

Long-Term Influences

The project leader of the **Land Trials** project, although he had no direct proof, suspected that a very popular soap opera in Brazil was produced because of the publicity given to these issues by the project. Although there have been no changes in policies related to ICTs in Brazil, the project leader suggested that policies were changing with respect to land ownership because the project increased awareness of the problem. In these projects, seminars, conferences, training sessions, newspaper articles, brochures and other printed materials have all been used to raise awareness. As well, face-to-face interactions have been very important for contact with a wide range of end users.

The **ACT Trade Information** project influenced the development of the National Agricultural Marketing Development Company (NAMDevCo) in Trinidad and Tobago. This state company runs the wholesale markets and uses the market information system developed in the project to put out a weekly bulletin of prices of food crops, fish, and other market commodities. The project led to other similar initiatives in El Salvador, Honduras, and Tanzania, and even after 9 years, ACT still receives requests for visits to discuss the system.

In at least one case, IDRC may have stopped funding the project before it could have an effect on the development plans of other agencies. In the **Cooperatives Tanzania** project, the Cooperatives College wanted to make the information system self-financing. A follow-up evaluation was recommended but never took place, which may have cost the Centre the opportunity to gather some information on economic self-sufficiency of the project.

Many Centre projects have benefitted from persistence (funding for up to three phases over 9–10 years) and from inputs from several organizations. This approach has encouraged donors to support ICT projects and provided sufficient time for projects to influence public perceptions and government attitudes.

Lessons about Policies

- IDRC has influenced national policy development and legislation in Africa and also the policies of donor agencies with respect to ICTs. Impact in these projects is the result of consultations and lobbying efforts by Centre staff and has been facilitated by the use of email and Internet access.
- Success in spreading interest to other organizations in the use of project results and the application of ICTs depended on the use of international fora (such as the Addis Ababa meeting) and on the sharing of information via electronic networks that linked like-minded donors. This required a great deal of commitment and effort by Centre staff.
- Centre-supported projects encouraged the adoption of ICTs and the sharing of information. The GIS-related projects have encouraged a more holistic view of development problems, and the community-based projects have helped supply planning information to farmers and health workers at the micro level.
- Public awareness was raised using a combination of more traditional means of communication — seminars, training sessions, newspaper articles.
- ICTs were used effectively to encourage public debate and to solicit input on telecommunications policy. A Web page was used, perhaps for the first time in Afrcia, to post drafts of policy papers. It would be interesting to know whether this method would be as successful for policy development in areas of legislation that were not so closely related to the technology that was been used to encourage the debate.
- As project leaders and program officers achieve greater international recognition, they become involved in a wider range of activities and can influence policy development through their participation in various advisory committees and lobbying groups. This happened in at least 5 of the 13 projects that were studied.
- Project success has been due in part to efforts to influence the views of other donors with respect to ICTs and to collaborative arrangements that have supported infrastructure development. IDRC has also benefitted by building on past successes and experiences and by sustaining projects though more than one phase.

Organizations and Interactions

Have ICTs encouraged new types of organizations or new forms of social interaction?

IDRC support has introduced ICTs and helped create an "information culture" within groups and organizations for which these technologies were new. The projects created an environment in which people with similar interests could share ideas and information. In this way, professional associations and informal networks were created that enhanced collaboration within disciplines and regions and across continents. Business and individual users were among the first to adopt ICTs in Asia, and, in Africa, policymakers have taken advantage of ICTs to collaborate on the development of policy and the planning of future investments in ICTs. Although ICTs played an important role in these interactions, traditional communications continued to play an important complementary role.

These projects helped create new groups and types of interactions in several ways. Some projects, such as **SDN Pakistan**, focused on the creation of the physical infrastructure needed to deliver new services, some, such as **REDATAM+GIS** introduced a new technology but built and supported networks of users with more traditional media (e.g., a newsletter), and still others enabled groups with common interests to collect and share information and develop policy.

Email and Internet

In settings in which computer-based communications had previously been limited, projects such as **SDN Pakistan** established electronic networks that provided the physical means for enhanced communication (usually by email). In this project, electronic nodes were established in five cities and businesses and individuals were recruited as users. The project was less successful in encouraging links within the country between government departments and between IDRC projects. The project also fostered links with schools to introduce children to the potential uses of these communication methods and established outside links to gather information from groups in Britain and the United States. It also led to the creation of a group of information professionals (systems operators).

In **PAN Mongolia**, a commercial company received IDRC assistance to develop Internet access for Mongolia. This project attracted 500 corporate subscribers, who in turn used the facilities to create their own special-interest groups. For example, the project leader reported that municipal governments now use the system to help coordinate local events and NGOs use the inexpensive email facilities that are now available to contact similar groups located in other provinces.

Traditional Communications

In the three projects that used GIS technologies, groups with similar interests in ICTs came together, but more traditional means were used to communicate among group members. The **REDATAM+GIS** project, for example, used state-of-the-art technology to analyze and interpret census data and better understand the data's spacial relationships with other geographically organized data. Working relationships were established with more than 30 countries in Latin America that used this software to support decision-making. Although they used state-of-the-art technology for data analysis and interpretation, the main forum for information exchange continued to be a user newsletter published in both Spanish and English. Similarly, **GIS Bihar** and **Health Information Kenya** took advantage of the most current GIS technologies for data collection and interpretation, but relied heavily on face-to-face communication for interactions among group members and target audiences.

In the **Cooperatives Tanzania** project, ICTs were used for information management, but no communications links were initially established between the computers. Since the completion of the project, the project leader reported that the Cooperatives College had installed modems to take advantage of computer communication. However, the two cooperatives continue to gather and share information with cooperative members using face-to-face communications and traditional forms of print media. The project also led to the formation of an Association of Cooperative Professionals to build on the computerization of cooperatives initiated by the project, and a new research department dealing with pilot projects and experimentation was established within the Cooperative College as a direct result of the project.

New Working Relationships

The **Land Trials** project encouraged the use of new communication methods and furnished the hardware necessary to create a support group among rural lawyers in Brazil. Currently, about 300 lawyers are using email to ask questions and share information about legal cases and decisions. The project has led to new working relationships among lawyers and encouraged improved links between lawyers and community leaders, unions, and churches. According to the project leader, the project helped change the way in which these local groups viewed ICTs. No longer did they see these ICTs as something used by "authorities and land owners," they now understood that these tools were part of the resources they could use to gather information and take joint action.

Global Links

The **HealthNet** project demonstrated that a network of land-receiving stations and a low earth orbit (LEO) satellite combined with telephone-based systems could link health professionals in Africa to an international network of health-care resources. As a result, African health-care workers were, for the first time, able to obtain and share information on a global basis. This fundamentally changed their access to information and their ability to ask questions and share experiences about diseases and case studies pertinent to their local environment. Within this project, medical information managers formed a regional consortium based largely on the initiative of one person in Zambia.

Policymakers

The **ANI** and **Public Process** projects were able to create links among groups interested in developing new policies related to ICTs in Africa. In the **ANI** project, ICTs were the primary vehicle used for communication among group members as they sought to develop a policy framework for Africa. This activity was undertaken in response to a ministerial-level meeting that recommended the development of a plan of action on information highways in Africa. ICTs facilitated the production of this African Information Society Initiative in less than one year with only two face-to-face meetings among team members. The **Public Process** project used ICTs to complement efforts to circulate a green paper among interested parties. A Web page was used to publish the paper and to serve as a forum for public comment and debate — perhaps the first time this approach has been used to develop legislation in Africa.

Lessons about Organizations and Interactions

- IDRC-supported projects used ICTs to enhance relationships among groups with common interest. By so doing, they have created an "information culture" within different groups of users (e.g., rural lawyers and community leaders in Brazil) and in new sectors of activity (e.g., agricultural cooperatives in Tanzania).
- ICTs provided a venue in which to share ideas and information. This has led to the formation of professional associations and informal networks that have enhanced collaboration within disciplines and regions and also served to carry interest in the use of ICTs across continents (e.g., from Latin America to Africa in the case of GIS).
- ICTs play a crucial role in the way that information is gathered and shared, but many groups still rely on more "traditional" ways to interact and learn. Face-to-face meetings, brochures, newsletters, and audiovisuals continue to be important for information delivery in these projects.
- IDRC-funded projects demonstrated that electronic networking could be used to speed the creation of government policy and enhance public input into the development of legislation related to ICTs.
- By linking like-minded groups (and by holding lectures and workshops and issuing articles and press releases) these projects played a role in forming opinions and perceptions about the uses of ICTs both by special-interest groups and the general public.
- ICTs are a powerful way to link individuals and groups to present a common voice. For example, women from Africa were more strongly represented at Beijing and lawyers and community leaders were more successful when they were linked in common purpose.

Resources

Have IDRC projects that involve ICTs been able to develop the human and institutional resources necessary to support the adoption of ICTs?

IDRC-supported projects combined the provision of technical resources with appropriate training. The technical resources included computers for data analysis, computer-based email and Internet services, GIS decision-support technologies, and satellite-based communications systems. Projects built on skills and equipment from previous Centre support and benefitted from links with other donors. Training of two types supported project activities. Technical training in the operation and maintenance of the ICT systems and "awareness" training for potential users and decision-makers. IDRC employed an approach that emphasized regional training and relied on local capabilities to establish and manage ICT systems. These projects used ICT resources to demonstrate the potential to improve communications using systems based on land-based telephone systems, satellite links, and enhanced interactions with local communities.

Collaboration with other donors, such as CIDA and UNDP, allowed the Centre to participate in larger projects and to establish working relationships with other donors so that information could be shared and lessons learned and applied more widely. These projects influenced donor concerns, provided an international platform for IDRC's mandate and vision, and allowed IDRC to continue to focus on the research aspects of multidisciplinary projects and to ensure that the "human" aspects of projects received due attention. The **CABECA** and **HealthNet** projects are good examples of donor collaboration to provide significant levels of technical resources and training.

ICT Training

Training and the provision of institutional resources took many forms in these projects, but in all cases, training and provision of hardware went hand-in-hand. In **SDN Pakistan**, computer-based communication systems were established on a national basis and systems operators and users were offered free training (that was advertised in local newspapers) to encourage acceptance and use of

these communications systems. In **PAN Mongolia**, a training centre was created and equipped with 20 computers. Over the 2-year life of the project, several hundred people were trained in different computer-related topics. Internet services were made available for the first time in the country.

The **HealthNet** project was successful in establishing a network of ground-receiving stations to establish a store-and-forward email system using LEO satellite technology. In addition to these physical resources, people were trained at two levels in the project. Those who were responsible for providing the service (30–50 people) were given technical training and about 300 people were taught to use the technology to access remote sites and to use email to communicate within the network. Within this project, volunteers were used to provide technical support. Although they had the technical knowledge to solve problems, they were often unable to do so because they lacked the time, transportation, or personal resources, especially when difficulties arose outside the capital cities.

In the **ACT Trade Information** project, computers were the tools used to manage market information. Individuals who worked on the project were trained in farming strategies and in using information technologies to devise marketing strategies. This training has allowed staff to obtain jobs in the Government and to offer consultancy services on the basis of their understanding of information technologies and their applications. The project continues to receive requests to demonstrate their system to other countries in the region.

Building on the Past

CABECA was designed to build on the earlier IDRC-supported telematics projects to create a sustainable networking infrastructure in Africa. This project invested heavily in infrastructure and training and also laid the foundation for further expansion of ICTs in Africa. As a result of this project and other related IDRC projects in Africa, a conference was held in Addis Ababa in April 1995 on Telematics for Development. This meeting and a followup one of African Ministers Responsible for Economic and Social Development and Planning helped mobilize government support and strengthen collaborative efforts within Africa to create information and communication networks for planning and decision-making.

Technical Training and Sensitization

The **GIS Bihar** and **REDATAM+GIS** projects introduced state-of-the-art decision-support software and hardware to the recipient institutions. Training in the **REDATAM+GIS** project in Peru was provided at the Economic Commission for Latin America and the Caribbean (ECLAC). This training involved technical training for programmers and sensitization workshops for planners and decision-makers who could use the software. In addition to the technical training, ECLAC was convinced to rewrite the REDATAM software so that it would run under the Windows operating system. This made the software a more valuable resource because it could be more easily adapted for use in other languages — specifically into French for introduction to potential users in West Africa. Because the project involved the University of Waterloo, Canadian graduate students as part of their training were also exposed to the developing world and to problems specific to that part of the world.

The **GIS Bihar** project provided technical training to 11 communications professionals. In this case, the technical staff were trained in the region (at the International Centre for Integrated Mountain Development, Kathmandu, and the Asian Institute of Technology, Bangkok) to build on earlier investments in GIS technology and to encourage regional collaboration. Training was also provided to ensure that key individuals were aware of the technology and how it could be used in their work. These sensitization workshops were held in collaboration with the local university and included key government officials. The academic community was also encouraged to participate in the project because an advisory group of local academics was constituted and some of the research associated with the project was contracted to the university.

Training Kits and Modules

In the **Land Trials** project, computer resources were provided and an initial focus was placed on the primary users of the information system — the rural lawyers. Community leaders and union leaders were then shown the value of the system and how it could be used. A subactivity within the project was the development of training kits that provided legal information about property and family law in easily understood language. These kits were targeted at the community leaders and were distributed throughout the network by email. In the **Cooperatives Tanzania** project, computers were provided to better manage agricultural information, and people were trained in both phases of the

project. About 100 people were trained to manage and operate the database system, and to ensure adequate training, self-training modules were built into the software. This project used no outside consultants to design or establish the information system; instead, it relied on trained local staff.

Lessons about Resources

- Two types of training are necessary: technical training to ensure that the technologies are properly installed and maintained and that technical staff are aware of changes in evolving technologies; and awareness training for potential users. This latter training has commonly been called sensitization and should be seen in the context of an overall marketing strategy. At least two groups must be reached. The staff who will be expected to use the technologies as part of their jobs and the decision-makers who control policies and funds.
- IDRC has been successful with an approach that emphasizes local training and relies on local capabilities to establish and manage information and communication systems. In this regard, IDRC has built on previous projects to deliver appropriate resources and training.
- Projects have benefitted from links with other organizations, such as UNDP, CIDA, and the World Bank, that have mandates to supply technical resources. IDRC has provided a valuable and complementary role by funding the research needed to introduce and apply these resources and supporting the training and sensitization needed to ensure their successful adoption and use.
- Provision of equipment was essential to create ICT capacity, but training to use, maintain, and adopt these systems was the most important input. Trained people are needed to derive benefits from ICTs and to convey the information to local communities.
- Projects that provided the resources to acquire ICTs have delivered enhanced communications capabilities that had been previously unavailable and opened new opportunities for collaboration and information exchange.
- The use of ICTs in these projects has demonstrated that it is possible to provide alternatives to telephone-based communication systems in Africa and elsewhere.
- Whether projects seek to deliver technical support or have an impact on community development, provision of supporting resources is critical. These resources may include transportation to reach remote cites, spare parts, or agricultural or health-care supplies.

Barriers

Have ICTs helped overcome barriers to development such as language, culture, and distance?

ICTs have played a fundamental role in overcoming barriers of distance. Many projects have been able to offer access to information resources that were previously unavailable or to establish new communication links. Electronic mail and associated list servers were the most important new features of projects. Email was used for such activities as gathering health information, seeking legal advice, collecting and sharing market information for agricultural commodities, and developing and monitoring projects. GIS technologies helped overcome distance in data collection and offered products that overcame communication barriers by presenting data in graphic form and showing the spacial relationships that exist among related development problems.

Distance and Time

The **ANI** and **Gender and Information** projects are prime examples of the use of ICTs to shrink the impact of geographic isolation. Distance no longer limited the ability of African women to share ideas and to influence international discussion, nor did Africans interested in the impact of ICTs on African development need to work in isolation. ICTs were instrumental in encouraging broader discussion and input into questions of regional and global importance. As email, and eventually Internet access, spread across Africa, these tools can be expected to play an ever-increasing role in continental communications.

The **HealthNet** project also overcame distance, but perhaps more important was its associated ability to deliver information more quickly. Time delays in receiving help with clinical diagnosis or treatment regimes were reduced. This project also pointed to some areas of concern for Africa. International use was largely limited to the expatriate community due to their previous connections with individuals and institutions outside their countries. The project reports also suggest that there are cultural barriers to be overcome in Africa. These barriers relate to a reluctance to share information and a tendency to value information from outside Africa more highly than local

knowledge. Effort will be required to encourage South–South sharing and to collect and distribute local information to ensure that local knowledge is both valued and collected while the power of ICTs is used to tap external resources.

Culture

The **Land Trials** project leader emphasized that distance was the main barrier that had been overcome, but, in addition, he felt that an important cultural barrier had been breached when community leaders and others interested in land-ownership law started to accept computer-based communication and information systems as part of their information environment or culture. In an associated way, the project also helped by "popularizing court language for others" — it had helped overcome the mystery associated with legal language and made it more generally accessible.

ICTs can also overcome traditional, hierarchical communications patterns. In the **CABECA** project, research information could be shared more quickly and directly among field offices and headquarters without flowing through more traditional information channels and management structures. In **SDN Pakistan** and **PAN Mongolia** information could now be easily accessed directly and without mediation. In **Land Trails**, legal advice was no longer available only from lawyers, people could obtain advice from their community leaders and union representatives.

Language

Language barriers were at least partly overcome by ICTs. In the **REDATAM+GIS** project, by adapting the Spanish and English version of the software to a Windows environment, it was easier to translate the data-entry interface into French, although the underlying code and associated error messages and comment statements remained in English. Mapping of data helped overcome barriers because it presented information to policymakers in a more understandable way and increased their appreciation for the potential of this technology. Use of ICTs can also help reduce language barriers because group members can translate or précis important points for others and share them over the network.

Ignorance of ICTs

Other projects, such as **Cooperatives Tanzania** did not make use of the communications part of the ICTs. The barrier that this project helped overcome was the ignorance of the potential of what ICTs (specifically, computerized databases) could do and how they could be used to address specific development problems. At a more macro level, the **ANI** project brought this appreciation for the potential of ICTs to an important cross-section of policymakers at the national level. All of the projects that made an effort to reach the general public with information about uses of ICTs played a role in this transformation and public information process.

Lessons about Barriers

- The projects most often overcame geographic isolation. ICTs provided the means for individuals and institutions to establish working relationships in spite of the distances that separated them. This allowed access to remote sources of information, the ability to share ideas and discuss problems, the means to provide input into policy development, and a mechanism to foster professional linkages among individuals with similar interests.
- The use of ICTs helped bring the problems faced by special-interest groups, such as women's groups, to a broader international audience and allowed them to present their views more directly at international forums and conferences. As Internet access becomes more common in Africa, recipients may want to share project results and present their views. This would require training in HTML publishing and in the Java programming language.
- GIS technologies can be used to present complex data in an easily understood visual format. These outputs emphasize important spacial relationships and can be used to suggest causes and effects in such important areas of development as health and the environment.
- Information is most effective when it is delivered in an appropriate way to end-users. It is important to determine what the users want and need and to tailor information products (e.g., legal information kits in Peru) to suit their requirements.
- ICTs can help to overcome language barriers to some extent. The ability to read and store messages provides time to "translate" messages (compared with face-to-face meetings) and allows those with inadequate verbal skills to participate in dialogues or benefit from translations provided by other members of the network. Windows-based software can make it easier to develop other-language versions of software.
- Access to ICTs has altered the culture of communications among some groups. For example, community leaders in isolated Brazilian villages no longer see ICTs as the tools of the rich and powerful. They, too, are starting to incorporate these tools into their information-gathering and communications arsenal.
- ICTs can be used to overcome time and distance barriers in project development. The **ANI** project linked several donor agencies and key national ICT representatives who not only developed but monitored and conducted the program with few face-to-face meetings. Email and list servers were used to encourage open dialogue.

Innovative Solutions

Have ICTs promoted new and innovative solutions to development problems?

In most of the projects, ICTs were the innovative aspect of the project. The new solution was the use of ICTs, rather than the ICT promoting a new solution. Several of the projects provided access to technologies that were new to the recipients and, in the case of the GIS projects, provided state-of-the-art software that offered capabilities that were previously inaccessible. The ICTs that were used included the use of LEO satellites, computer-based communications systems, GIS software, and computerized databases. These technologies provided project personnel with tools that helped them to work toward solutions to development problems.

Data Management

Some projects developed solutions that related directly to improvements in the use of data resources. For example, in the **Cooperatives Tanzania** project, the solution to the problem was to computerize the database to better manage the information resources. The existing methods of data collection and distribution continued to be used, but the ICTs improved the way in which the information was stored and managed. Similarly, in the **ACT Trade Information** project, data management was an important problem. The ICTs helped both to manage information and to collect and share it more effectively. Modem-to-modem communication was established, which in the words of the project leader was "a great advantage, because in 1988 computer communications technology was not as sophisticated as it is today ... our information capability made us an official depository for market information on small farmers crops throughout the Eastern Caribbean."

The **GIS Bihar** project, as well as **Cooperatives Tanzania** and **ACT Trade Information**, used ICTs to better manage agricultural resources. By gathering and sharing information on crop production, crop inputs, and farm-gate prices, these projects brought improved management to these agricultural activities and supported the work of agricultural cooperatives. Such an innovation in the **ACT Trade Information** project was the establishment of a credit program that supported

production planning that was oriented toward capturing peak markets. All of this was centred around the information system. In the words of the project leader, "we were also able to support regional marketing because as a depository for regional information we could make the necessary comparison to forecast the prices in other territories."

Electronic Communication

In the case of **SDN Pakistan**, a national system for computer-based communication was created. This facility allowed the members of the sustainable development network to share information electronically with international partners. As a result, information on toxic chemicals, the impact of leaded gasoline, and the dumping of acids on aquatic life was obtained from international sources. A specific request for information on toxic chemicals brought dozens of responses from individuals and international organizations, some of whom had scanned handbooks and commercial databases to provide the requested information.

In Mongolia, the **PAN Mongolia** project provided enhanced communication by offering Internet access for the first time. The project leader felt that the nation-wide email and fax system that was established was changing the "telephone-centric" view that had previously been held for rural communication. He predicted that because email and fax based on VSAT (Very Small Aperture Terminals) technology were three to four times less expensive than telephone-based systems, small communities and villages would purchase these communications centres themselves. These ICTs offer the potential for rural communities to jump directly to this form of communication rather than depend on the extension of land-based telephone systems.

The **HealthNet** project demonstrated that LEO (low earth-orbit) satellite technology could be used to improve communications and to help solve the "last mile" problem by delivering health information in a timely fashion to rural areas. In this regard, the Navrongo Health Research Centre in an IDRC evaluation was deemed to be "a forerunner in adopting new information and communication technologies." As a spinoff, the project also created interest in using LEO satellites for polar and maritime communication in Canada. Recent announcements by Microsoft and Motorola of their ambitious plans to create a global telephone network based on LEO satellite

technology may offer important opportunities for the future of communications in Africa and other parts of the developing world not serviced by telephone lines.

Decision-Support Software

Projects that involved GIS capability brought new decision-support software to the analysis of data and helped apply the information to a variety of planning problems. In **GIS Bihar**, planners were invited to Sone Command Area Development Agency (SCADA) to see the relevance of GIS to their work. Subsequently, the Superintendent of Traffic, the Secretary (Forests), a World Bank team working on a population project, the Ministry of Human Resource Development, and the Ministry of Rural Development expressed interest in using GIS for planning activities. The Department of Institutional Finance is now using the technology to plan the expansion of bank branches based on population densities in rural areas.

In the **Health Information Kenya** project, the project leader reported that the GIS application had provided "a totally different approach to analyzing and presenting development problems" and had "created community-based health information that could be used by local village health committees and health planners in solving development problems."

Visual Arts

In Brazil, the project leader of **Land Trials** suggested that the project helped create an environment suitable for a successful soap opera based on problems related to land reform and land ownership. Although no direct relationship exists to the project, he believed the project had raised public awareness to the point that such a program was topical and therefore could attract a large audience. The visual arts were also a part of the **Gender and Information** project. Sketches were performed for male colleagues to illustrate how females were marginalized in their use and training in ICTs. The use of theatre provided an innovative way to use humour and promote goodwill during discussions that sought to address this problem.

Lessons about Innovative Solutions

- ICTs are valuable tools that help people gather and analyze information, store and manipulate data, and improve communication. The ICTs were, in most projects, the innovation. ICTs improved the capability of individuals and institutions to tackle and solve development problems.
- Computer-based communication systems effectively link groups and individuals and provide a practical way to access and share external data resources.
- Satellite technology can deliver information in a timely fashion to remote rural areas and can change the way that planners view rural communication by offering an alternative to land-based telephone systems.
- ICTs are based on technologies that are rapidly changing. Technologies that led to innovative solutions 10 years ago (such as modem to modem communication) are considered commonplace today. IDRC has played an important pioneering role in encouraging and supporting projects that investigated or demonstrated the usefulness of new ICTs to development efforts.
- GIS technologies are particularly useful for showing the special relationships that exist between various development problems related to health and the environment. The visual products produced by GIS can be used to communicate with a range of audiences from villagers to development planners.
- IDRC projects have allowed experimentation with ICTs. The human aspect of projects is crucial — the ability to use the technologies that are available today, to adapt these to local conditions, and to assess the relevance of evolving technologies. Training is, therefore, an important part of project design.

Empowerment

Have ICTs helped to empower individuals through access to information and affordable and timely communication capabilities?

Individuals and groups were empowered by ICTs because they provided the means to access, enhance sharing, and deliver information in a timely fashion. As a result, a culture of communication was created within the projects. Databases helped people organize and extract information; email and Internet linked users to outside sources of information; satellite technology provided access to bibliographic material and allowed health-care professionals in remote areas to seek outside consultations on the diagnosis and treatment of patients; GIS technologies produced maps that improved understanding of relationships among development problems; and policymakers used ICTs to collaborate on policy development. Speed of information delivery was important for lobbying efforts, medical treatments, and inputs into market prices for products. Projects that empowered local communities, demonstrated that information must be tailored to the needs of users.

Access to Information

Provision of the tools needed to access information was the most common means of empowerment. In **SDN Pakistan**, private, business, and government users had access to improved communications facilities that allowed them to consult a much broader range of information sources. The project introduced the concept of computer-based communication to many potential users by offering free training sessions and seminars. Members of the sustainable development network were able to establish links to outside databases and to exchange information with an international network of special-interest groups. Communications infrastructure was also provided in the **PAN Mongolia** project. Full Internet access was provided for the first time and 500 corporate clients now use the system to access outside sources of data and to advertise their products and services. In the words of the project leader, the project has "given us very wide and cost-effective access to the world." It

will be interesting to see if this project helps open communication channels to provide access to information from and about Mongolia.

The **HealthNet** satellite communication system provided Africans with access to worldwide bibliographic materials and enabled health-care professionals to participate in fora that would otherwise have been inaccessible. These communications links allowed participating institutions, such as the Navrongo Health Research Centre, to attract skilled scientists to their remote location and also to secure additional donor funding. The ICTs provided the means to obtain advice and information that could be applied by health workers to help save peoples' lives. Also in Africa, the **CABECA** project provided the resources needed to link Africans with outside sources of information. This empowered individuals who became better informed and, according to the project leader, were able to avail themselves of opportunities such as scholarships and career advancement.

Improving Decisions

The GIS projects (**REDATAM+GIS**, **Health Information Kenya**, and **GIS Bihar**) applied state-of-the-art decision-support tools to development problems. This software, which was developed at the University of Waterloo, allowed the projects to extract census data for small geographic areas in ways that were tailored to the needs of planners. The projects provided the means to combine and present this information in a visual form that made the interrelationships between different factors more easy to grasp. This combination of capabilities meant that information from a variety of sources was more accessible. Project leaders and program officers reported that for the first time policymakers began to see the links between population data and health and environmental concerns and to take these relationships seriously.

The **ANI** and **Public Process** projects also empowered policymakers. On a continent-wide basis, **ANI** provided the opportunity to develop policy frameworks and perhaps most important to develop an approach to collaboration among agencies interested in ICTs in Africa. This raised awareness about the use of ICTs in both donors and government officials. Questions are now being raised at the national level about monopolies in service provision and the impact of lack of access to the "information highway." The **Public Process** project has contributed directly to the ability of South

African politicians to articulate policy and develop legislation and regulations related to ICTs. It also provided a way to encourage broader public input into this process.

Tailored Information

The **Land Trials** project empowered rural lawyers in Brazil by linking them to a source of legal advice through the use of an email system. This reduced their sense of isolation and allowed them to ask questions and post information about cases and judgements. This network was the first of its kind in Brazil and the project leader indicated that it is now serving as a model for other similar networks. The project also fed information to community leaders, church groups, and unions. A retired judge was hired to present in "common language" information about land trial cases. This feature of the project helped demystify the legal language to a level that these local leaders could more easily understand and communicate to their communities.

Timely Information

The **Cooperatives Tanzania** project provided the necessary training and resources to allow the Cooperatives College to establish and install a working information system. Initially, the chief accountants were most appreciative of the system because it made their decision-making more accurate and timely. For example, for the first time up-to-date information was available on coffee prices, which meant that payments to cooperative members could be more accurate. Better information could also be provided to the government on such statistics as crop yields and profits. Although details on how use of this information may have affected production and marketing by the cooperatives is not available, it could be expected to improve such efforts.

In the **ACT Trade Information** project, ICTs were used to create a computerized database on domestic food-crop production for eight Caribbean countries. The project developed local skills in programming and allowed ACT to expand the services it provided throughout the Eastern Caribbean. The project leader stressed how important it had been to have the local programming skills. This allowed the programs to be tailored to the needs and conditions that existed, rather than forcing the use of "foreign" solutions and terms. In his words, the software must have a "cultural imprint." These skills allowed ACT to deliver timely market information to small farmers who were then in

a better position to make decisions about their crops. The ACT continues to produce economic data for neighbouring countries and to welcome visitors who want to learn about their information system for market and trade information (the most recent from Honduras in February 1997).

In the **HealthNet** project, the use of satellite technology allowed rural health workers to obtain information about the care and treatment of patients more quickly and also to benefit from consultations with colleagues about the most appropriate treatment regimes for unusual cases. Use of ICTs empowered these health professionals to improve patient treatments and expanded the areas to which prompt medical advice could be delivered.

Lobbying and Advocacy

In the **Gender and Information** project, ICTs were very important to allow project participants to undertake national and international lobbying and advocacy. For example, a woman in South Africa working on women's reproductive and health rights knew that information on legal precedents could strengthen her groups' campaign. As a result of a message posted to a mailing list, two women in other countries provided information on legislation that strengthened her case. During the Women's International Conference in Beijing, African women were able to access information on the proceedings and had the necessary tools to contribute an African perspective to the discussions. ICTs also facilitated lobbying for policy changes related to telecommunications within the **ANI** and **Public Process** projects in Africa.

Lessons about Empowerment

- ICTs empower people by providing them with access to information that was previously difficult or impossible to obtain.
- ICTs provide the means to deliver information quickly, and by so doing create such opportunities as the ability to respond to market conditions and the chance to improve the diagnosis and care of patients.
- ICTs enhance the sharing of information resources across continents and help diverse groups work on shared agendas — whether these be for research, advocacy, or the application of information to problems in areas such as health or agriculture.
- A "culture" of collaborative work among participants was encouraged by the use of ICTs. In some cases, this extended to project development and monitoring; in others, the technologies broaden the number of inputs that were sought for problem solution or policy development.
- Empowerment is most successful when information is tailored to the needs of users. These needs should be determined in advance, and information products and services developed specifically to address these needs. Information is most useful when "translated" into appropriate language and presented in ways that suit users' needs.
- Real empowerment depends on training, not simply the provision of hardware. Hardware and software are constantly evolving and changing — trained staff are crucial if institutions are to adapt to these changes and make informed decisions about the options with which they are presented.

Community Involvement

Have IDRC projects that involve ICTs been able to encourage community involvement in the creation and use of these new technologies?

Local grassroots communities depend on intermediaries — health workers, lawyers, cooperative and extension workers, and information and communication specialists — to mediate their access to ICTs. Projects that involved cooperatives and local community organizations came closest to providing more direct links. Community information centres helped deliver information, develop a better understanding of community needs, and collect information from the communities. Agricultural cooperatives were able to deliver crop-related information to farmers and, because of their ongoing relationships with the farmers, gather information as well. Close attention to community needs and the ability to develop appropriate targeted information services and products are crucial.

Links to Communities

If the concept of community is broadened to encompass geographically separated individuals who have similar interests, then women's groups, medical workers, policymakers and legislators, GIS specialists, environmental associations, and private individuals and businesses have all benefitted from access to ICTs. These groups have used the systems that were made available through the projects, but did not necessarily participate in the creation or initial design of the systems. For example, in the **Land Trials** and **SDN Pakistan** projects, end-users were not involved in decisions about the ICTs that were to be made available. In the **HealthNet** project, decisions regarding technical issues (e.g., selection of hardware and software) were frequently made without consultation with network coordinators at the field level.

The projects that were developed with cooperatives and community groups appear to have had the most direct input from users into the design of the information systems that were created. Perhaps this is because of the cooperative experience of the recipient institutions. Associations such as ACT

and the Cooperative College already had established data-collection activities and close community links; therefore, the ICTs were used as tools to manage data at the local level. The **ACT Trade Information** project used ICTs to provide information to communities of producers. In Dominica, for example, it supported the activities of the Dominica Farmers Union so that small farmers could pool their production to enter new export markets. The project was also able to alert traders to the effects that the 1986 devaluation of the Trinidad and Tobago dollar would have on prices and competition.

Some of the other projects were designed to operate at a much broader geographic level. In these cases, the community of users were information and communication specialists who saw the opportunity to create national information infrastructures in Africa. These projects required access to, and knowledge of, available options and a considerable amount of technical knowledge. ICTs were used to facilitate project development and to gather input from all members of the community. As these projects were implemented, new communities of users evolved at the national level. However, because of the pioneering efforts that these projects were making, often the primary users of the systems were better educated and trained individuals who already possessed the skills needed to use these ICT systems.

Matching Community Needs

As a result of the **Gender and Information** project, women entrepreneurs are exploring the possibility of providing direct community access to ICTs. These women envisage the establishment of kiosks that would be walk-in centres for people who do not have access to computers, telephone lines, or modems at home or at work. The project leader reported that many of the women who attended national training workshops saw the potential in pursuing this activity. In this case, direct involvement of the community to define the services and information that will be provided will be important.

Users of the communications system installed in **SDN Pakistan** included both businesses and private individuals. They used the system, but did not contribute directly to its creation. The same is true of the users in **PAN Mongolia**. They adopted the system and used it but were not involved in its

creation. However, these users may well contribute to the future development of these networks as they start to pay market prices for the services they receive and, consequently, demand additional features that suit their needs. It will be interesting to see whether these users will be willing to pay for access to specific information such as commodity prices and market information or will expect these features to be part of the enhanced access (such as full Internet access) that they are likely to want. This distinction will play an important role in the sustainability of specialized information services as compared with the sustainability of service provision.

In **Land Trials**, up to 300 lawyers in Brazil are linked to the legal information system, but as the project leader stressed, this is still a very small number of the total lawyers who are working in rural areas of the country and much work is needed to expand the system. However, in the locations that are serviced by this system, community leaders are active in asking questions about cases and lawyers are using it to deliver information about cases and judgements. The community leaders have in effect become "popular lawyers and legal consultants" to other members of the community. Because the users are asking questions, they are now having an effect on molding the system to their needs and altering the content of the information that flows over the system. They are, in fact, helping to refine the system to suit their own needs.

Community Health

In addition to the broad links that were established within the **HealthNet** project, at a more local level, workers in four provinces in Zambia were linked to the Ministry of Health. This allowed practitioners to get answers to questions about medical conditions more quickly, which in turn decreased the amount of travel that was necessary and increased the quality of health care at the community level. For example, practitioners were able to get rapid access to information on the diagnosis and management of rabies and spina bifida to address clinic emergencies. Also in the health sector, the **Health Information Kenya** project with AMREF placed emphasis not only on collecting health and other data from the community, but delivering information back to the community via community information centres. Transparent flip charts were used to show the connections between water use, agriculture, and health that had been illustrated by the GIS technology. In these efforts, women, community health workers, and midwives played important

roles. The project has helped communities use data for decision-making and understand how problems are linked.

Public Consultations

The **Public Process** project in South Africa was designed to help the Ministry of Posts, Telecommunications, and Broadcasting to formulate a telecommunications policy through public consultation. The project encouraged open public policy debate and input into policy development and the formulation of laws and regulations. The community of users in this case included government officials, IDRC, and the public. ICTs were used to develop and critique the policy, and a Web site was established to allow additional public (global) debate.

The **ANI** project used ICTs to influence policy change and expand consultation and collaboration. Email and list servers were used to design the project and to monitor it during implementation. International partners (e.g., UNESCO, ITU, UNECA, Bellanet, and IDRC) maintained links with each other and with the national working groups. The ICTs in this case speeded the process of consultation and collaboration and contributed to the successful administration of the project.

Lessons about Community Involvement

- ICTs can increase community awareness. They were used to sensitize government officials to the potential of ICTs and the need for policy reforms and increase public awareness and solicit public input.
- Although end-users may not have participated in the creation of ICT-based communications systems, as users adopt the systems for their needs, they can be expected to start to affect the information on the system and the services that are provided.
- Projects that have used ICTs to provide information for community use have been most successful when they have involved the community in deciding what information is to be collected and distributed and have delivered the information in ways that suits local conditions and needs.
- ICTs create a sense of community among isolated individuals or organizations. After these groups are formed around common concerns, they can use the ICTs to take joint action (e.g., influence policies, market produce, sound international warnings about pollution).
- ICTs provide an effective way to develop and manage projects that involve groups that are unable to meet on a regular basis.
- Because these projects introduced new technologies, initially, the primary users were the better educated and trained individuals who possessed the skills needed to use the ICT systems.

Jobs and Economic Activity

Have ICTs played a role in creating jobs or other forms of economic activity?

IDRC support has created some jobs and economic activity closely related to the conduct of the projects selected for this study. In most cases, the jobs were in the information and communication sector and tied directly to the projects. Programmers, systems analysts, and service providers were employed by specific projects. It is difficult to find evidence for direct and significant job creation beyond the immediate domain of the individual projects. Nonetheless, a few of the projects did create conditions that favoured economic activity or supported groups that could create or influence economic activity.

Within this group of projects, job creation and economic activity were not primary objectives. In cases where some productive spin-offs were created, they were the result of secondary influences or of the creation of awareness about market potentials.

Direct Influence

Two projects in Asia had a direct influence on jobs and economic activity. **SDN Pakistan** and **PAN Mongolia** were able to create computer-based communication and information networks in these countries. (See Table 1 for abbreviations used to identify specific projects.) **SDN Pakistan** established email services in five cities in Pakistan and promoted the use of electronic communications to individuals and businesses and to a lesser extent to government departments. During the life of the project, several other commercial service providers were established, and at least one of the providers credited the project with "opening the market" in Pakistan. Although the level of job creation cannot be quantified, the project played an important role in introducing this form of computer-based communication to Pakistan. The project leader also reported that their "cybermart" service was very popular, which suggests that the project had a positive effect on economic activity among businesses that used the system to advertise their products and services.

In **PAN Mongolia**, IDRC support established Internet access to provide increased connectivity with the outside world. Jobs were created for 10 new employees at Datacom Co. Ltd. This project was unique in that it was developed with a commercial entity that was already providing communications within a domestic network. Datacom was originally a state-owned enterprise, but it was privatized just before the project was developed. The project successfully created an Internet service provider in Mongolia and the project leader reported that about 500 corporations were using the service. Again, although impossible to quantify, the services that were created are being used by commercial enterprises for their own purposes and presumably contributing to economic growth.

Local Employment

The projects created jobs that were filled by nationals of the host countries — they did not depend on foreign experts. On average, this amounted to about a dozen jobs for information and communications professions in each project. These jobs were in such fields as computer programming (**REDATAM+GIS**), systems analysis (**Cooperatives Tanzania**), and geographic information systems (**GIS Bihar**). Spin-off jobs were also created for service providers (e.g., in **HealthNet**) and within institutions that adopted the new technologies or software (again, most often for communications and information professionals). In the **Health Information Kenya** project, the project leader pointed out that the project "created several jobs for local artisans who were involved in the construction of community resource centres." Job creation may have cost others their jobs. Three program officers suggested that clerical and messenger jobs could have been lost as a result of computerizing data collection and management and computer-based communication systems.

Secondary Influences

Several program officers pointed out that projects can stimulate economic activity through the collection and distribution of information. For example, if the **Cooperatives Tanzania** project improved the efficiency with which the cooperatives managed themselves, the program officer argued that they could be expected to increase their efficiency in resource use and the marketing of produce, but he admitted that insufficient evidence existed to demonstrate this effect. Similarly in **GIS Bihar**, management of hydrological and agricultural resources was strengthened, which would be expected to lead to economic improvements. An evaluation of the **GIS Bihar** project is on-going

and, according to the program officer, may provide data related to the project's contribution to economic activity.

Evidence of economic activity is reflected in the ability of recipients to attract other projects or new donors for their activities. The Sone Command Area Development Agency (SCADA) (**GIS Bihar**) has been able to attract five other government projects that are all tied to watershed management. These projects had a direct benefit in creating jobs within SCADA and further promoting the use of GIS as a decision-making tool within the State of Bihar. The same project has also been able to attract World Bank funding for a project to investigate environmental issues in the power sector. The **HealthNet** project was also successful in attracting funding from such organizations as the World Bank, the Ford Foundation, and the Rockefeller Foundation. These additional project activities could be expected to create additional direct employment and perhaps spin-off economic activities.

Increased Awareness

Projects have used many methods to increase the awareness of the general public to the use of ICTs. These activities have included radio, newspaper, and magazine articles and a broad range of workshops and seminars. Beyond creating an awareness of the value of ICTs, it is not clear if they have led to economic activity or job creation. But, in the long term, increased awareness should help to create a "market" for ICTs.

Increased awareness of ICTs and their potential role can also awaken entrepreneurial skills. GreenNet conducted a needs assessment of over 200 women's groups in Africa 12 months in advance of starting the **Gender and Information** project. Women responded that skills in ICTs could become important ways for women to generate income. From the communities in which the project now works have come suggestions for future economic activity. Women have expressed interest in establishing kiosks to provide access to computers, telephone lines, and modems. These "walk-in" communications centres could provide both economic returns and links to community activities.

Choices

Projects can also affect where people choose to work. In the **HealthNet** project, seven Ghanaians working abroad returned to Africa to work on the project, at least partly because they could do so and still remain connected to the international research environment. The communication facilities existed to maintain these links because of the project. Movements of key project staff to other positions also had an impact on use of technology and potential jobs. For example, the Chairman of SCADA (**GIS Bihar**) left the project to become a special advisor to the Minister of Finance, and the Ministry has since expressed interest in using GIS technology in its decision-making processes.

Self-Sufficiency

Job creation and economic activity are important aspects of self-sufficiency. As projects are developed to provide email and Internet services, which are likely to generate economic interest from the private sector, revenue generation should receive increased attention. In **SDN Pakistan**, the customer base was created by offering free training and access, and in at least one case a commercial supplier complained about unfair competition. If services continue to be free, will customers continue to value the service and make the transition to payment? If they do not, long-term economic viability may be in question. Market research would help answer such questions and better prepare projects to move to self-sufficiency through the development of appropriate business plans.

Policy Issues

Policy-related projects can be expected to have long-term impacts on economic activity. The **Public Process** project in South Africa created legislation and regulations related to the information sector. These policies will affect how this sector evolves and ultimately will impact on job creation and future economic activity through such factors as import duties on equipment, licences to operate systems, and tax incentives. In the project file, it is suggested that Canadian companies might also benefit because of the market opportunities that will be created and the goodwill established because of the direct role that IDRC and CIDA played in helping the South African government develop relevant legislation. This would be an interesting aspect to monitor.

Lessons about Jobs and Economic Activity

- Jobs were created for information and communications professionals. Although there is some evidence that other jobs have been created in such groups as service providers, it is not clear that they would not have been created as the private sector explored the possibilities of profit from investments in Internet-type services. Some projects contributed to creating a favourable environment and perhaps accelerated the introduction of such communications services.
- IDRC-supported projects were implemented using local expertise to install and manage information and communication systems, including such state-of-the-art technologies as GIS. This reinforces the validity of IDRC's philosophy of developing and hiring indigenous human resources.
- IDRC developed a project with a commercial company in Mongolia. Given the current interest in electronic communications (and specifically the Internet) it seems likely that future projects could increasingly be developed with commercial entities, which should be willing to share costs and may already have made significant investments in infrastructure.
- Business and individual users have been the first to accept and use email and Internet services. This suggests that projects may need to focus on business users as key entry points and potential sources of revenue as they strive for self-sufficiency.
- If projects are expected to create or support economic activity, it is important to build business plans into the projects from the start and to monitor this evolution along with all other parts of the project. This will be particularly important if more projects are developed with commercial enterprises.
- Without investments in follow-up evaluations, it is difficult to assess the impact of projects on job creation and economic activity. If more projects are developed with specific "economic" goals, business plans and evaluations of economic performance should be built into their design to assist with monitoring and facilitate mid-course corrections.
- Public awareness of the potential of ICTs was increased and potential markets were opened. For example, women in Africa are investigating the potential of walk-in kiosks to provide ICT access. This idea should be monitored to learn from their experiences.

Lanfranco Analysis

The framework used for this analysis was developed by Sam Lanfranco, Senior Program Specialist with the Bellanet International Secretariat and an Associate Professor (Economics) at York University. Lanfranco has extensive overseas field experience related to ICT and is responsible at Bellanet for helping development-community partners learn how to use ICTs effectively in development activities. In this section, the Lanfranco framework (see Appendix 4) is used to take a fresh look at the information gathered in this study. Rather than look at the projects on the basis of the eight questions that defined the study, this approach seeks to take a more holistic look at the projects and to highlight the lessons learned with regard to the role of ICTs.

In keeping with the overall structure of the Lanfranco framework, the projects were aggregated according to the presence of ICTs in the virtual workspace (the four quadrants: administration; research and learning; products and services; and communications), and the contribution of ICTs to the three domains in this workspace (email, groupwork, and digital objects). An overall look at how the projects used ICTs is shown in Figure 1.

Analysis can take place at the entity level, the component level, and at the stakeholder level within the entity's broader environment. Most of the analysis here takes place at the level of the entity. (The framework allows for comments on what was not done as well as what was done.) Figure 2 presents a diagrammatic view of how each of the projects used ICTs within their virtual workspace.

Administration

The focus here is on how projects use ICT to enhance their administration. The **Cooperatives Tanzania** project used their data system to keep better tabs on price information and as a result the financial officers were more confident that the members were receiving the correct amounts for their produce. In this case, there was no transmission of data by electronic means. The information was extracted and used directly. Future uses could include storing these resources in digital format for

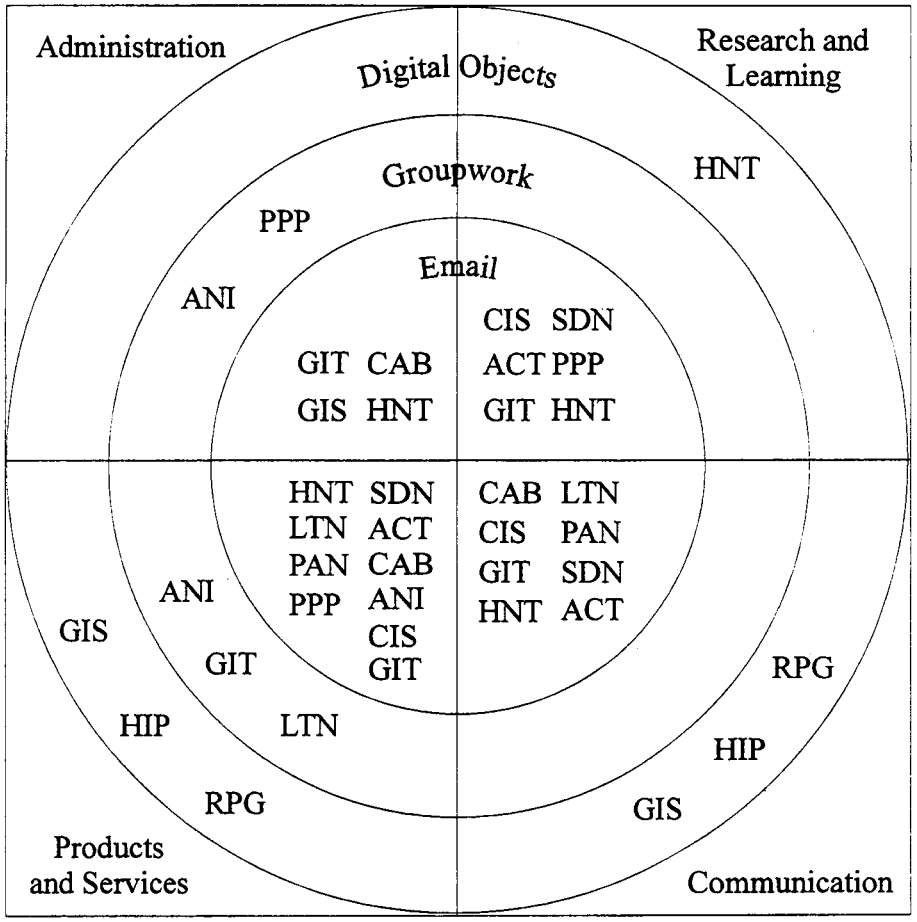

Figure 1. The distribution of projects within the Lanfranco framework.

ACT ACT Regional Market and Trade Information (Eastern Caribbean)
ANI African Networking Initiative: Defining a Plan of Action
CAB Capacity-Building in Electronic Communications for Development in Africa (CABECA)
CIS Pilot Cooperatives Information System (Tanzania)
GIS Geographic Information System (Bihar)
GIT Gender and Information Technologies (APC Women's Networking Support Program)
HIP Community-Based Health Information and Planning (Kenya)
HNT Healthnet: Satellite Communications Research for Development
LTN Land Trials Information Network (Brazil)
PAN PAN Mongolia
PPP Public Process for Formulating Telecommunications Policy and Regulation: South Africa
RPG REDATAM + GIS Generic Population-Related Application Tools
SDN Sustainable Development Network Pakistan

Note: Appendix 4 provides an explanation of the four quadrants that characterize the virtual workspace (administration; research and learning; products and services; and communications) and the three domains (email, groupwork, and digital objects) within this workspace.

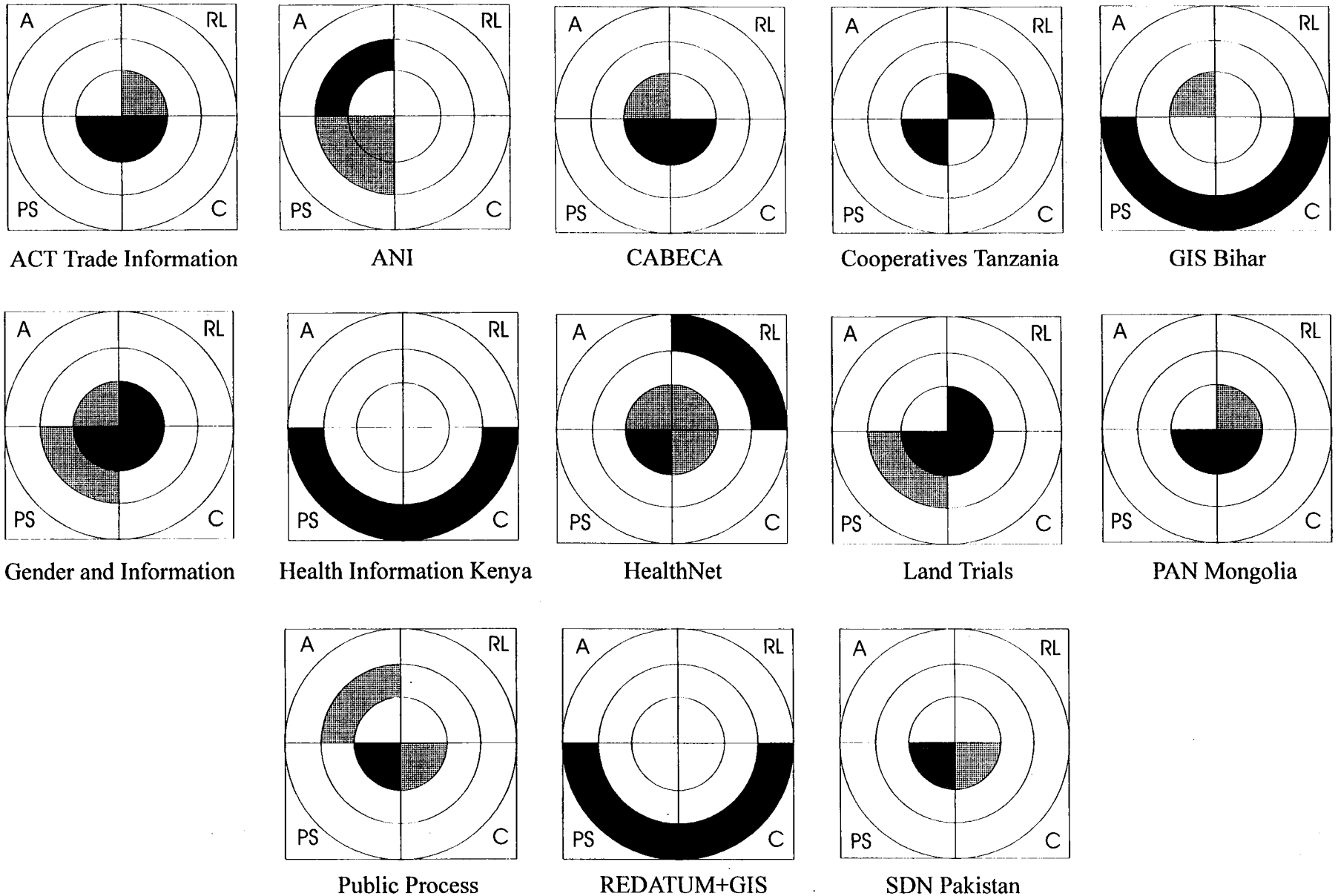

Figure 2. Lanfranco representation of role of ICTs in projects: ■ Significant ▒ Moderate | | Little or None.

remote access by interested cooperatives, as well as the use of email links to improve communications among cooperatives within Tanzania.

Many projects use email to stay in touch with IDRC, for funding accountability, and as a source of technical support. In such cases, email largely replaced regular mail and courier services. Email offers time and cost savings, even as a replacement or vehicle for fax transmission. However, more effort could have been made to document the cost and time savings that were realized. The projects as a whole managed to make the transition to the new ICT uses. However, little effort seems to have been made to capture lessons about this process or document these savings as a way of enhancing technology adoption strategies, or to inform policymakers responsible for departmental or institutional policies. We encounter situations such as in **SDN Pakistan** where personal and business users far outnumber the government users of the email system established by the project.

One interesting outcome in administrative capacity related to staffing in the **HealthNet** project. ICTs were used in this project to help recruit staff. Expatriates returned to their home countries, and used the communications facilities to continue collaborative research with international colleagues and remain linked to external information sources.

Policy development related to ICTs was a significant focus in some projects. ICTs were used to facilitate the development and implementation of projects through the use of email. In the case of the **Public Process** project, the use of ICTs included the use of the Internet as a workspace for posting working documents and soliciting public input.

This evidence of the uses of ICT for project administration does not focus on the obvious uses, sometimes present sometimes not, with respect to financial records and human resource management. They illustrate ways in which use of ICTs can enhance project administrative capacity. There is not enough evidence to assess the extent to which the projects included policies, training, and resources to make systematic ICT use appropriate to the administration of projects.

Research and Learning

However one defines a "knowledge age," research and learning become endemic to the work of any organization. It must continue to research and learn to sustain its own capacity in the pursuit of its mission and vision. This is part of what is meant by being a "learning organization." Most of the projects examined here were designed more to learn about the ways in which ICTs could be applied to development problems and situations, rather than to conduct research on ICTs per se. Several of the projects build on lessons learned from earlier research on the feasible uses of ICTs.

Several things were learned from the projects about the uses of ICTs. Many of these lessons were highlighted within the answers to the eight questions addressed in the research. For example, in terms of direct employment effects, ICTs do create jobs for communications professionals, may have impacts on other groups of workers, and could stimulate job creation through their impact on economic activity. ICTs may be an effective way of reducing barriers of time and space, and working across cultures and languages. If this reduces obstacles to social, political, and economic activity, there is scope for significant gains. Even their use in geographic information systems is making the capture, analysis, and access to data more efficient and effective. The electronic venue makes the combining and sharing of data from different sources both more effective and more accessible. Access to information complements the traditional distribution of information.

ICTs had less effect than might have been expected on community activities, both in a literal and a virtual sense. There is scope for the effective creation of new groups and the development of new approaches to development problems. The projects that were linked directly to community activities (e.g., **Health Information Kenya**) had the most potential for influencing community action. However, the role of ICTs seems secondary here to the ability of local leaders to mobilize community action.

ICTs provide the basic resources and input (venue), but it is the people who make things happen. Although the venue's properties may influence the direction of outcomes, it is people and groups who make things happen. One might conclude that in the context of Africa, it is too early to look for impacts because the communications systems are still in their infancy. However, perhaps it is in such

settings that the opportunities to leverage the benefits of ICTs are the greatest because the alternative in many cases may be little or no communications.

GIS projects offer the potential for important inputs into research and learning. The GIS projects had an effect on the perception of problems, such as communities and planners grasping the direct relationships between various contributing factors to health and the environment. These uses could lead to policies or actions (solutions) to address these problems and to develop appropriate uses of GIS in community activities and policy development.

Products and Services

The product range in these projects is wide. Products include such things as the creation of ICT infrastructure, ranging from simple store-and-forward email to the establishment of national Internet services. Some projects such as the health-services network based on LEO (low earth orbit) satellite technology carried ICTs into applied service and product delivery. The use of ICTs as an electronic venue and virtual workspace for policy development in the South African telecommunications sector, and the creation of a network of GIS centres of excellence are examples of using ICTs to strengthen capacities to apply ICT to other missions.

In most of these cases, ICTs were the direct subject of the projects. They were the tool or infrastructure that was being developed. The product was the information that could now be delivered to, and made accessible to, a broader audience than ever before. The **Gender and Information** project brought views from Africa to the Women's Conference in Beijing through the use of email and groupwork. **HealthNet** delivered health information on demand from digital objects stored in databases a continent away to doctors in rural communities in Africa. It also encouraged groupwork by providing electronic facilities for doctors to discuss diagnosis and treatment of patients.

Land trials (Brazil) reduced the feeling of isolation of rural lawyers and provided a central source of legal advice. As the project matured, it used email to deliver "massaged" information to community leaders to help them educate the general public about legal issues related to land tenure.

The GIS projects helped combine census information with other geographic information and present the results as maps. This turned out to be a very powerful way to depict spatial relationships among development problems — such as water-borne diseases and the lack of boreholes. These maps were used to demonstrate the usefulness of the technology both to policymakers and planners.

There is little evidence to suggest that any of the projects progressed to the stage of using ICTs to contribute to groupwork on a significant basis or to establish digital object sites that could be accessed from outside their organizations. (The spread of web-site technology will quickly change the ability to do this). The regional sharing of resources among institutions within Africa should be emphasized as networking capacity grows. This approach to the electronic venue would help enhance local capacities to develop indigenous solutions, encourage greater institutional collaboration, and start to bridge cultural barriers to the sharing of information. IDRC could play a major role in this effort by requiring that all IDRC-funded projects to publish results electronically and make these resources available to others. Perhaps this could be a condition included in the Memorandum of Grant Conditions. Key digital objects dealing with capacity building (e.g., training and workshops) could be mirrored to regional sites so as not to tax the capacity of regional electronic networks. This effort could be linked to ongoing support for ICT infrastructure projects and would help to develop local, relevant content for the networks.

Communications

At the core of ICTs is their ability to enhance remote asynchronous access to information. This can be information for decision-making, for collaboration, for research, or for learning. It can be across a project or across the globe. The four tests of communications use within a project are how it: (1) uses ICT to communicate within the parts of the project; (2) uses communications to incorporate remote resources into the work of the project; (3) gives access to others to incorporate project resources into what they do; and (4) how it joins into larger electronic workspaces as a responsible stakeholder.

ICTs should not be thought of as simply relationships that link end users to digital objects. The crop-based information gathered by cooperatives was redistributed after analysis through traditional

distribution systems. The same is possible for email used to share information for: (1) sustainable development and legal issues; (2) the creation of Internet access for Mongolia to link it and its businesses to the world; (3) the use of mapping techniques to interpret and communicate information; (4) the use of LEO satellites to overcome communications problems in regions not serviced by land-based telephone lines; and (5) the use of computer networks to influence the agendas of international fora and organizations and to play a role in the development of national policies and legislation.

In most cases email was the method of choice, and it has been used much more for person to person communications than for groupwork. As well, the systems have been used predominantly for the retrieval of digital objects from developed country locations. It appears that little effort (and little understanding) as occurred in support of creating a "digital presence" for African projects on the broader global stage or for making their resources accessible to a broader external public.

The current rapid rate of growth of electronic infrastructure in Africa, albeit from a very low initial base, is presenting Africa and development projects with an electronic venue upon which to build new structures and support processes to encourage sustainable African development. This analysis of lessons learned has been designed to point the way both to better implementation practices and, as important, better policy and evaluation perspectives when dealing with the role of ICTs in development.

Conclusion

ICTs have arrived. It is not a question of whether they should be part of development plans but rather how the influx of these technologies can be harnessed to contribute to sustainable development. ICTs are the basis for computer-based communications systems that use email and Internet and for satellite-based systems that span great distances, remove the constraints imposed by land-based telephone systems, and offer new tools, such as GIS, for data analysis and interpretation. These technologies offer to link communities and individuals at lower cost, and with greater speed, than ever before. The challenge is to ensure that these technologies enhance development. It is increasingly important to study how the information that is provided by these systems is actually used.

Community Involvement

Different projects developed interesting ways to encourage community involvement with ICTs. The legal information kits created in Brazil, the community information centres used by AMREF, and the information kiosks planned by the women's groups in Africa use interpersonal skills and supporting communications materials to deliver information in appropriate formats. Projects should continue to stress these skills because they produce two benefits. First, they allows projects to better disseminate information at the community level. Second, and perhaps most important for the future, they allow project personnel to gather information from the community.

Cultural barriers are said to exist in Africa with respect to sharing information and overvaluing outside information. Nonetheless, in the HealthNet project, the African Medical Librarians' Bulletin was frequently cited as the most useful of all the HealtNet information services, due in large part to its solicitation of input from African countries. Although there may be a cultural reluctance to share information and overvalue outside sources, perhaps part of the problem reflects the limited effort that has been made to encourage and promote input from Africans into information systems.

As Internet access spreads in Africa, international links will become easier to establish and care will be needed to ensure that development of local information resources is not ignored. Future information systems must be designed to include local input as well as information from external sources. Only increased effort will ensure that local problems and solutions are captured and become part of the communications output of projects. External solutions, conveyed by electronic means, are no more likely to provide lasting solutions than earlier development efforts based on technology transfer.

ICTs offer the potential to enhance collaboration and reduce information deficiencies as local solutions are developed. Perhaps all Centre projects should be encouraged and assisted to establish a Web presence. The Acacia Initiative could take the lead in this regard by coordinating and linking local inputs and encouraging international links. This would help ensure two-way sharing of information among projects and with those interested in development on a global basis.

Training in skill specific to creating a greater Web presence for projects will become important. To complement these efforts, projects should invest in software and training to enhance the production of print and audiovisual materials using computer technologies. Use of these materials should be an important part of the communication and dissemination plans of the project. Interpersonal skills training would enhance both dissemination and data collection.

Massaging Information

As access to information and communications facilities is improved it will become increasingly important to place greater emphasis on the "filtering" or "massaging" of information. In Africa, some users are already complaining about information overload. Successful projects have screened information or provided some level of analysis to make the information more useful to users and to enhance the likelihood that special interest groups will be developed and sustained. Projects should continue to solicit potential users on their information needs and on the ways in which they would prefer to receive information. Needs surveys of local communities will grow in importance as will the ability to present information into more understandable language and in carefully targeted packages.

Financial Aspects

Given the current interest in electronic communication, and especially the Internet, commercial potential may exist for ICT projects. This commercial potential, coupled with dwindling financial resources for development activities, suggests the need to investigate ways to integrate ICT projects with commercial ventures — especially those projects that are designed to introduce electronic communications facilities. Training of project recipients in marketing strategies and the development of business plans will become increasingly important if efforts are made to develop economically sustainable ICT systems. It will be important to continue project support for a sufficient time to test various approaches to cost recovery and profitability and to document the successes and failures.

In particular, emphasis will need to be placed not only on technical achievements but on demonstrating and documenting time and cost savings offered by new communications technologies. These savings have not been well documented in Centre projects. In Pakistan, business and private users quickly used the services that were provided, but only about 5% of the users were government departments (a group targeted by the project). It is important to understand the reasons for this difference in use. It may not simply be related to the ease with which private users can decide to change services. Government departments may be reluctant to "open up" their communication systems or to provide access to their information resources. Policy changes to adapt to the changing electronic environment are required.

Policy

Governments in Africa have expressed their desire to take advantage of the potential of the "information highway". IDRC has helped countries to develop policies related to ICTs, and these efforts should be continued. Policy changes should increase access to communications technologies and encourage greater investments in technology. IDRC could play an important role in ensuring that governments recognize the importance of providing access to their information resources and by encouraging input from all IDRC project recipients. These efforts to coordinate activities and input will take dedicated staff who will be required to expend much time and effort to ensure success and to enable good working relationships among all partners.

Evaluations

It is important to continue to learn from past experiences. Projects may take several years to produce concrete results or influence policies, and it is only though evaluations that information can be obtained on impacts. Evaluations should be part of project design and should be conducted both to allow for on-going feedback and mid-course corrections during the life of the project and to allow for information gathering at a later date. It takes concerted effort to learn about impact. In the past, program staff have devoted much more effort to project design, less to monitoring, and even less to analysis and evaluation. Evaluations should look at the role and effectiveness of the ICTs, but should be founded on evaluating the impact of projects on development.

The Lanfranco framework helps focus attention on the inputs of ICTs in projects. Its structured approach helps ensure that all aspects related to ICTs are considered, and it is particularly well suited to pointing out areas where ICTs are not playing as significant a role as they might. Given the need to mediate communication between ICTs and local communities, the model could be more specific about the links between the virtual workspace and community users and the interface between ICTs and traditional communications methods. Given the possible interest in economic activity, it might also be useful to be more explicit in suggesting how economic activity can be captured within the framework. As efforts are made to refine the framework, it would be useful to use the framework as the basis for a full evaluation of one or two specific projects. This could be part of planned evaluations in current projects or a separate exercise to further test and refine the framework.

Appendix 1. Project Abstracts[1]

Pilot Cooperatives Information System (Tanzania) (90-0305)
This project will allow the Cooperatives College of Tanzania to implement the data base designed in the previous phase I project. Phase I improved the efficiency of existing manual systems of collecting, organizing, storing, retrieving, and transmitting information in the agricultural cooperatives movement, through the development of a computer-based data processing and information management system. In this phase, the College will install an operational system at two cooperative unions where information on crop procurement and farm inputs distribution will be collected, processed, and disseminated with downward and upward linkages to primary societies and national apex organizations respectively. The data base will be tested at these two sites to determine its applicability for effective control, planning, and decision-making within agricultural cooperatives using actual data collected from primary societies and unions. Training will include operation and maintenance of the system for staff, and orientation seminars for leaders of cooperatives.

ACT Regional Market and Trade Information (Eastern Caribbean) (91-0064)
The two previous phases of this project allowed the Association for Caribbean Transformations Agricultural Information System (ACT-AIS) to acquire computer hardware; develop its own data management system; write anlaytical program; and collect, store, analyze, and disseminate data nad information to small-scale producers. The ACT-AIS was developed into five operational modules aimed at capturing the data necessary for agricultural planning and production. This third phase of the project will improve the Trade Module. It will serve to promote and support diversification efforts on small farms by encouraging intra-regional trade. A range of information products and multiple access mechanisms will be develop to disseminate information on trade and market opportunities. The project will facilitate the marketing of fresh produce directly or via local associations, NGOs, or the agricultural supporting services units of regional institutions.

Land Trials Information Network (Brazil) (91-0307)
The problem of conflicts relating to land ownership continues to play an important role in the socioeconomic condition of much of the rural population of Brazil. Legal aid lawyers have been providing legal counsel to disputants, and have been intervening more and more directly in the legal proceedings. This project will consolidate the available information on land ownership conflicts and trials in support of the work of legal aid lawyers and community action groups for the resolution of land disputes. The resulting information base will be used to analyze each stage of the lawsuits, and to propose on the basis of advice from expert counsel, the appropriate measures to be taken in moving toward solutions in those areas with the most serious land-related conflicts. The project will establish a computer-based land trials information network linking 11 rural NGOs to the Instituto Apoio Juridico Popular (AJUP). It will also test the use of email and computer conferencing for data exchange; implement security procedures; and evaluate the operational and overall effectiveness of the network.

[1] Project abstracts extracted directly from databases in IDRC Library.

HealthNet: Satellite Communications Research for Development (91-1043)
Phase I of this project saw the acquisition of increased communication capacity through the launching of HealthSat, a store-and-forward satellite. This second phase project will contribute to the capacity of researchers and professionals in health and related fields to effect change through access to information and communication capabilities; strengthen the capacity of developing country institutions to provide more effective support for the research process; and test, demonstrate, and evaluate the use of packet radio and satellite communication techniques in support of health information flows and networking. The development of applications will initially be in the Essential National Health Research (ENHR) context as well as in support of other health-related networks especially where there is an overlap of interests. The concept of using this technology for improving access to information and communication capabilities within the health field is known as HealthNet. Specific project activities include obtaining local radio licenses, establishing ground stations, and training local personnel to manage these stations.

Geographic Information System (Bihar) (92-0611)
Bihar is a state endowed with extensive, fertile agricultural land and rich mineral deposits. It has, however, lagged behind the rest of India despite receiving massive assistance from the government. To better understand the causes of this lag, IDRC supported the Kirori Mal College of Delhi University to develop and carry out a demonstration project "Bihar: An Evaluation of Change, India" (88-0269). The project demonstrated the suitability of GIS (geographic information system) techniques in mapping large volumes of data for planning at the subnational level. As a result, the project has produced a comprehensive Bihar state-wide GIS digital database and addressed some GIS-based applications. This project will establish a GIS capacity at the Sone Command Area Development Agency (SCADA) to fulfill SCADA's information requirements for sustainable and equitable integrated rural development of the Soine River Watershed at various scales (watershed, district, village, and farm levels). The main objectives of the project are to design and establish: a decentralized GIS-based information system to collect data, build, and manage rural development databases at the district and command area levels; maintain and update the GIS-Bihar database; provide GIS services and access to databases to governments and district authorities; and develop specific GIS products to be delivered to selected users in Bihar for development applications.

Capacity-Building in Electronic Communications for Development in Africa (92-0616)
The projects supported in Africa by IDRC's telematics program have demonstrated the technical viability of electronic communications and have highlighted several issues: organizational problems can often be greater barriers than technical problems; human resource development for ongoing training, troubleshooting, and handholding is essential; unless sustainable systems are developed, networking capabilities available to the majority of African institutions will be limited to short-term, ad hoc arrangements dependent on external funding; cooperation and collaboration are required nationally and regionally between users, service providers, and donors as African countries cannot afford the luxury of developing separate physical networks for each user group; and the user base in Africa must be expanded dramatically before INTERNET-style international interconnectivity can be justified. This project will address these issues by demonstrating how a sustainable communications and networking infrastructure can be developed in Africa. The model to be implemented will involve; the establishment and/or strengthening of national nodes serving the networking needs of a wide array of institutions and individuals; for every five or six countries, one

of the national nodes will be identified as a subregional resource centre for that set of countries to provide training, troubleshooting, software support, network management, and research functions; and national nodes will provide national networking services with a self-sustaining fee structure and will provide interconnectivity with other national nodes and systems outside Africa (payment for service will be in local currency).

REDATAM + GIS Generic Population-Related Application Tools (92-1152)

The national census is one of the largest investments that a country makes in a single data collection effort. It contains socioeconomic and demographic data on all areas of a country, often down to city blocks. REDATAM (REtrieval of DATa for small Areas by Microcomputer) is a software package developed by the Centro Latinoamericano de Demografia (CELADE) to permit easy access to population data from national censuses through selection by small geographic areas and to facilitate its statistical analysis. It was developed through previous project support in response to clearly identified user needs for a tool to be used in demographic research. Since the original version, its capabilities have been extended to generalize the selection and processing capabilities to handle multidisciplinary hierarchical databases. This phase will complete the integration of GIS (geographic information system) capabilities, and develop and test several generic REDATAM-based decision-support software tools and applications for planning and implementing social and economic development projects at the subnational level. Selected applications will be created in the fields of social services and poverty, with equity and target group focalization in Chile and Costa Rica, planning urban growth with constraints on expansion in Costa Rica, and assessment of the effect of tourism development on local environment and population (with special consideration for small island countries) in Saint Lucia.

Community-Based Health Information and Planning (Kenya) (93-8480)

Health care systems in Sub-Saharan Africa face increasingly diverse and complex problems. Programs are imposed on local systems from the national level, and community participation in planning and managing these programs is low. Local health care management and use of health information is limited by highly centralized decision-making processes. Information systems lack population-based epidemiology, service quality data, and socio-cultural information. Those unable to access the formal health care system remain invisible and do not enter into the conventional health care planning process. The Ministry of Health in Kenya supports the development of strategies for an enhanced health care management and planning capability at the district and divisional levels. This project will implement a community-based health information system. Project participants will develop appropriate planning and management procedures, and ways of generating useful health information; and describe the process of local health development participation by community members and health workers. Geographic information systems technology will be incorporated to analyze multiple source health, environmental, and related sector information. Also, cost analysis will be undertaken.

Sustainable Development Network (SDN) Pakistan (94-0602)

UNDP's Sustainable Development Network (SDN) Program is much more than an information network for sustainable development. It is a mechanism for creating an enabling environment and framework for sustainable development by facilitating access to information and by encouraging consultative processes at all levels of society. Pakistan was one of the first countries to participate

in the SDN initiative reflecting the interest already shown in this area through their development of a comprehensive National Conservation Strategy (NCS). This project will promote sustainable development and the implementation of Agenda 21 through the NCS in Pakistan by facilitating increased access to information, knowledge, and expert advice and by increased communications between stakeholders locally, nationally, and globally. More specifically it will establish interconnected computer-based networking services in five cities in support of NCS and sustainable development information access and exchange; promote the effective management and utilization of information and information technology in support of informed decision-making for sustainable development; link users of information with sources of information nationally, regionally, and internationally; influence the policy domain in related areas (telecommunication, information technology, etc.); and carry out research and provide consultancy services in the area of networking, and information management and utilization.

PAN Mongolia (94-8008)
The Pan Asia Networking (PAN) Program will provide the physical electronic infrastructure for general networking in the Asian region. This project in Mongolia will provide the Centre with the means to experiment with methodologies, approaches, and protocols re the PAN approach. The general objective is to establish a country networking pilot project, as a possible operating model for the PAN program. Specifically, the recipient institution will implement enhancements to software and hardware systems for the provision of electronic networking services within the country, and connectivity with international networks. Internet services will be provided. The case study will be reviewed at a planned meeting of PAN's potential partners as well as showcased during the INET conference, both to take place in June 1995 in Singapore.

Gender and Information Technology (APC Women's Networking Support Program) (01269)
The Association for Progressive Communications (APC) and Partner Networks will implement a two-year program focused on increasing women's access to training, technology, information, and networking tools, with specific emphasis on women in the South. In the short term the goal is to better equip women with the necessary technical and informational capacity to enhance their organizing and strategizing for the UN's Fourth World Conference on Women (UNWCW) in Beijing. Six modules will be implemented within the framework of the UNWCW process: UNWCW Outreach and Networking Support; UNWCW On-Site Technical Operations; Gender and Information Technology; African Networking Support Program; Latin American Networking Support Program; and Asia/Pacific Networking Support Program. This project is providing support for the Module Gender and Information Technology: the implementation of a broad and diverse range of activities incorporating gender-sensitive technical training, information sharing, policy strategizing, and research in the field of computer communications.

Public Process for Formulating Telecommunications Policy and Regulation: South Africa (02430)
The election of South Africa's Government of National Unity (GNU) in April 1994 has resulted in the need to extend full government services country-wide. The GNU's framework for extending these services is the Reconstruction and Development Program (RDP). Implementation of the RDP and of the recommendations of the two IDRC Mission Reports, "National Information Project: South Africa" (Harfoush & Wild, May 1994 and Akhtar, Melody and Naidoo, November 1994), which

defined a framework for a national information policy for South Africa, depends heavily on an expansion of the telecommunications network, both in terms of geographical and population coverage, as well as modern data and information service capabilities. A key goal of the RDP is to improve telephone penetration in a country that has a small, highly developed and technologically sophisticated urban sector existing alongside large, underdeveloped regions with limited access to telecommunications. In parallel with this is a growing need amongst many business and government users for access to the more sophisticated, value-added telecommunications-based information services required to interface at the international level. The general objective of this project is to assist the Ministry of Posts, Telecommunications and Broadcasting of South Africa in formulating a telecommunication policy and regulation through a process of public consultation. The methodology involves: the production, publication and distribution of a Green Paper by an international team of consultants and national counterparts; a public consultation process to obtain feedback and input on the Green Paper, including public hearings of the Parliamentary Select Committee on Communications on the Green Paper; the preparation and distribution of a White Paper; and the drafting of legislation. This project complements the broader project "National Information and Communication Programme - South Africa" (#02294), which aims at advising and assisting the Government of National Unity in conceptualizing, designing and implementing information programmes, systems and policies in support of its development goals.

African Networking Initiative: Defining a Plan of Action (02770)

In Africa, the situation regarding telematics and networking is especially urgent, given the generally poorer telecommunication and information infrastructure, and growing development and information gaps. IDRC, the ECA, Unesco, and the International Telecommunications Union (ITU) have already established an effective working partnership to explore some of these issues. Bellanet, a multidonor funded initiative aimed at increasing the impact and relevance of development assistance through the utilization of communications technology, is also a partner in this effort. This partnership led to a successful African Regional Symposium on Telematics for Development in April 1995 in Addis Ababa, which produced a set of recommendations. In May 1995, the Conference of African Ministers Responsible for Economic and Social Development and Planning called for work on "national information and communication networks for planning and decision-making as part of Africa's information highway", for exchange of experiences, and for the establishment of a high-level working group on information and communication technologies (ICTs) made up of African experts to prepare a plan of action. This project will address these requirements. It will provide a mechanism for broader African input into ICT program and project planning in Africa; provide input into the planning processes of partner development assistance agencies; identify gaps and opportunities for collaboration among agencies and others involved in this field; and determine areas requiring further investigation and research. The project will also review the status of electronic communication and access to Internet in Africa.

Appendix 2: People Who Provided Information

Project Leaders:

Lishan Adam	*Capacity-Building in Electronic Communications for Development in Africa (CABECA)*
Karen Banks	*Community-Based Health Information and Planning (Kenya)*
S A Chambo	*Pilot Cooperatives Information System (Tanzania)*
Isa Q Daudpota	*Sustainable Development Network (SDN) Pakistan*
Dangaasuren Enkhbat	*PAN Mongolia*
Nancy Hafkin	*Capacity-Building in Electronic Communications for Development in Africa (CABECA)*
Brent Hall	*REDATAM + GIS Generic Population-Related Application Tools*
Dirk J Jaspers Faijer	*REDATAM + GIS Generic Population-Related Application Tools*
Bidhanesh Misra	*Geographic Information System (Bihar)*
Hezron M Oranga	*Community-Based Health Information and Planning (Kenya)*
Miguel Pressburger	*Land Trials Information Network (Brazil)*
Allan N Williams	*ACT Regional Market and Trade Information (Eastern Caribbean)*

Program Staff:

David Balson	*Capacity-Building in Electronic Communications for Development in Africa (CABECA); HealthNet: Satellite Communications Research for Development*
Djilali Benmouffok	*Geographic Information System (Bihar)*
Peter Browne	*Pilot Cooperatives Information System (Tanzania)*
Gilles Cliche	*African Networking Initiative: Defining a Plan of Action*
Janet Hatcher-Roberts	*Community-Based Health Information and Planning (Kenya)*
Renald Lafond	*Sustainable Development Network (SDN) Pakistan*
Sam Lanfranco	*Lanfranco Framework*
Paul McConnell	*Community-Based Health Information and Planning (Kenya)*
Zbigniew Mikolajuk	*REDATAM + GIS Generic Population-Related Application Tools*
Pat Thompson	*ACT Regional Market and Trade Information (Eastern Caribbean)*

Appendix 3: Questionnaire

Dear (NAME)

IDRC is working on a major initiative that will explore how concerted investments in, and application of, information and communication technologies (ICTs) by African communities can help build local resources to solve development problems. These technologies allow people to collect, store, process, and access information or communicate with each other. The premise is that if adopted and appropriately used, these technologies can address development problems and make improvements in peoples lives. This program is called the Acacia Initiative.

I have been contracted by IDRC to gather information about completed IDRC-funded projects and activities to test some of Acacia's assumptions about the role of information and communication technologies (ICTs) in development. The objective is to extract lessons that will influence the design and implementation of the Acacia Initiative and identify ways in which ICTs might enhance the use of IDRC-supported research results.

Your project (PROJECT NAME) was one of fifteen projects selected for this review. I am therefore asking you to respond to the following questions with respect to this project and any related activities. I am conducting this survey by email because I have a very limited amount of time for this review. I would ask you to reply within three days of receiving this message.

Thank you for taking the time to contribute your ideas and insights to this review.

1. Did the project help to create jobs or other forms of economic activity? Did ICTs play a role in this process?

2. Did the people who were involved in the project form new groups or start to communicate in new ways? Please describe the group or activity and explain what was new and what effect this had. What role did ICTs play in this process?

3. Did the project influence the development plans of other agencies? Did it influence how ICTs fit into those plans? Please explain and give examples.

4. Did the project influence government policies related to ICTs? How?

5. In any of the activities related to the project, did ICTs help over come barriers such as language, culture, or distance? Please give examples.

6. Did the project or associated activities create or apply new solutions to the development problems addressed by the project? Did ICTs play a role?

7. During the project, did individuals gain access to information or communication facilities that allowed them to do things they could not do in the past? What role did ICTs play?

8. Did the project have an influence on community activities? In what way? What role did ICTs play?

9. Did the project train people or create resources that will influence the future use of ICTs? Please describe the training and indicate the number of people who were trained. What resources were provided?

10. Did ICTs play other roles or produce other results in the project?

11. In the project, what were the most important ways of exchanging information or communication among groups or individuals?

12. Overall, would you say that the value of ICTs to the outcomes of the project were insignificant, moderately significant, or very significant?

Appendix 4: Lanfranco Framework for Evaluating Projects that Involve Information and Communication Technologies[2]

This framework was designed to learn more about the role and impact of information and communication technologies (ICTs) on the behaviour of projects and the achievement of project objectives. The framework situates ICTs within organizational structures and social processes. It seeks to help us make better policy and management decisions about ICTs in development projects and to sharpen our evaluation tools when dealing with ICTs and the ICT component of projects.

The framework is based on the concept that ICTs produce an electronic or virtual workspace that has the ability to rapidly cross traditional organizational structures and workspaces. This ability is based on the fact that ICTs can store and process digital information (numbers, text, and audio and video) and also transmit or retrieve this digital information both quickly and at increasingly low cost. As a result, new types of organizations and social processes, based on asynchronous collaboration, are evolving and being developed.

The framework was developed to help evaluators to ask questions and collect appropriate data and can be applied at several levels of analysis. Three levels are identified in the framework: (1) the entity itself; (2) its components; and (3) the entity in relation to its stakeholders. The evaluation of the entity examines the contribution of ICTs to the mission and objectives of the project, program, or process. The component-level evaluation looks at how ICTs are used within the entity to affect the efficiency and effectiveness of organizational structures and workspaces in the parts that make up the entity. The evaluation at the stakeholder level looks at how ICTs affect the entity's position and behaviour within the larger structures and social processes to which it belongs.

The entity under evaluation can be an organization, project, task, or individual. At the most micro-level, it can be examined with reference to the impact of ICTs on the structure and operation of its components. The component-level analysis looks at how the parts of the entity use ICTs to do

[2] This is a précis of the concept of the framework. Complete details can be obtained from Sam Lanfranco at lanfran@bellanet.org

their work and work together. It seeks to determine how ICTs transform organizational structures and work within the entity itself. At the most macro-level the stakeholder analysis looks at how ICTs can change organizational structures and work processes between the entity that is being evaluated and other entities that are part of a larger environment in which it is located.

Traditional evaluations usually focus on treating the entity as a discrete unit. Because ICTs can have a large impact on collaboration among stakeholders, and because evaluation should take account of external effects and interdependencies, at least one part of the analysis should be conducted at this macro-level.

The framework assumes that ICTs operate within and between four quadrants that can characterize the activities of any entity: administration; research and learning (for internal capacity building); products and services; and communications (within and beyond the entity). Each quadrant can be treated as an entity at the micro-level and is subject to analysis using the same conceptual framework.

ICTs enable activities in each of these quadrants and within this electronic workspace, and ICTs operate across three virtual domains within this workspace. First, ICTs facilitate the movement and processing of digital information. Simple email can represent the core, the command centre, of the entity's electronic workspace. It links the component parts of the entity and provides a link to the rest of the world. The second domain is called the groupwork space. It is here that asynchronous collaboration takes place across time and space, either within the entity or beyond. The third domain supports the creation, use, distribution, and access to stored digital objects (files, databases, audio and video objects, etc). The components of the framework are shown in Figure 3.

The actual ICT components (hardware, software, and communications facilities) provide the technical infrastructure for the electronic venue that supports this virtual workspace. These components can be evaluated directly as they contribute to the properties of the workspace, and indirectly as they contribute to the mission of the entity, project, or task. That does not constitute an

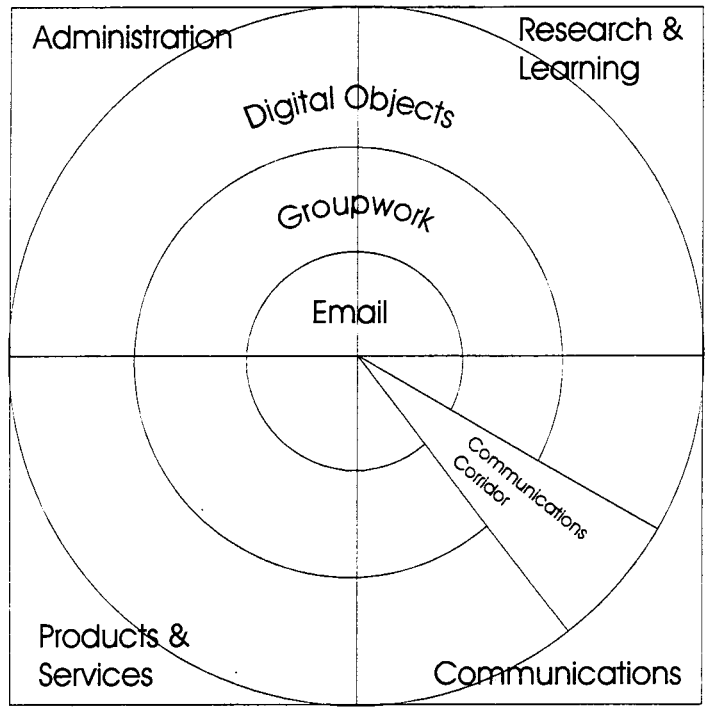

Figure 3. Lanfranco framework for project evaluation.

evaluation of ICTs within the entity any more than an analysis of road and bus construction would count as an evaluation of a regional transportation plan or a transportation authority.

The ICTs can be seen to underpin three new capacities: (1) a virtual workspace within the entity, which could range from stand-alone computers for word-processing and data analysis through to an internal local-area or in-house intranet; (2) a communications corridor for the entity to access remote sites and to incorporate remote resources into the local workspace; and (3) a communications corridor for remote sites to access resources within the entity.

These three capacities, the local workspace, local access to remote workspaces, and remote access to local workspaces, in asynchronous and synchronous time, constitute the central focus of this evaluation framework

The capacity for remote access raises issues related to which resources and venues will be made available to others. For example, what obligation is there, and under what terms, to make resources

available to others? What obligation does a non-profit organization have to seek cost recovery through sales of electronic goods and services? What obligations do public and private entities have to offer access to electronic resources as part of their corporate or civic responsibility?

The framework operates at three levels. It can be applied to the virtual workspace (Figure 3) for the entity, for each of its component parts, or for the entity as a stakeholder in a larger grouping. The objective is to help organize relevant questions and to identify information and evidence. The four-quadrant approach aids evaluation because it focuses on how the entity operates within its virtual workspace, how its component parts relate to each other in that space, and how the entity relates, as a stakeholder, to other entities within a larger virtual workspace.

The purpose of the framework is to properly include the ICT component in the evaluation process. The framework also allows questions to be asked about the relationship between the entity's existence within the electronic venue and its existence in a purely literal sense. The framework is intended to complement the traditional evaluation of the literal entity or process.